TECHNICAL MANUAL

for

GENERAL PURPOSE TRANSMITTER

MODEL GPTM-1KE/8

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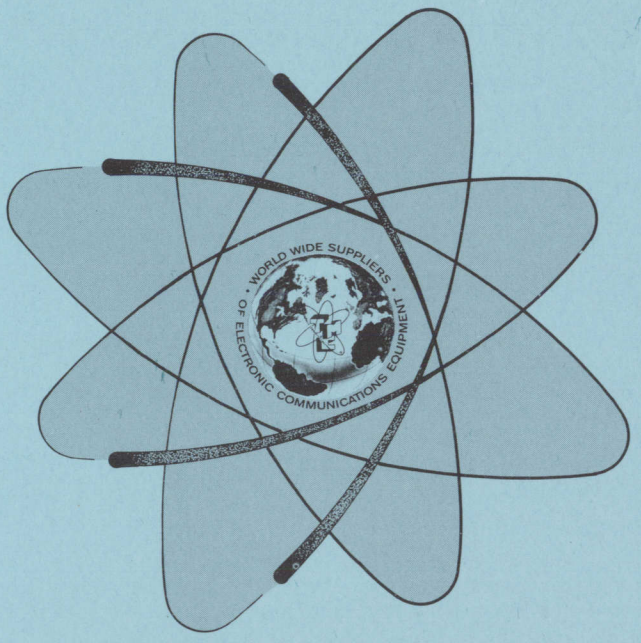

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

Printed in U.S.A.

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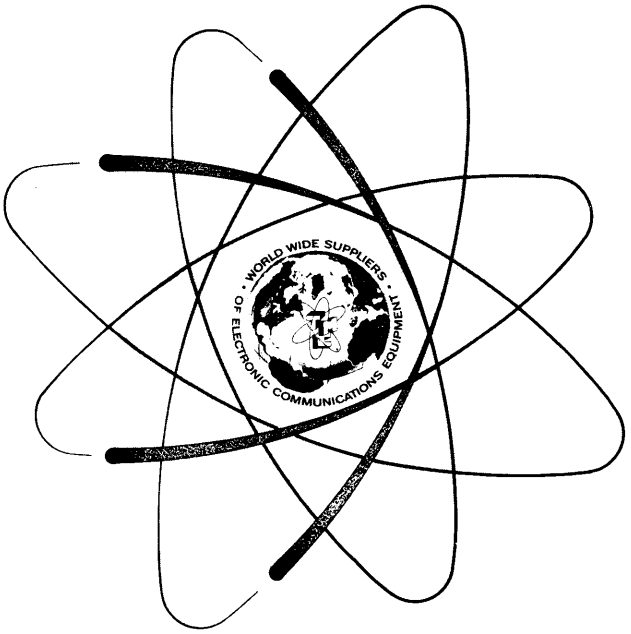

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SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION

The Model GPTM-1KE/( ) transmitter is a manually controlled general purpose transmitter. It was designed and manufactured by The Technical Materiel Corporation of Mamaroneck, New York, to deliver 1KW of peak envelope power (PEP). The transmitter will operate at any one of up to eight preselected crystal controlled frequencies in the 2 to 30 MHz range, in one of eight operating modes. The transmitter consists of three basic modular units, a solid state exciter, Model SME-5, and two linear power amplifiers, a Model HFL-100 and a Model TMA-1K and a Model AX5192 Circuit Breaker Panel.

The 100 milliwatt output of the exciter is raised to the 50 watt level by the HFL-100 broadband amplifier. The TMA-1K amplifies this signal to supply the 1KW (PEP) rf output of the transmitter (500 watts average power).

The operating modes of the GPTM-1KE/( ) transmitter in relation to the emission classification is shown in table 1-1.

TABLE 1-1. EMISSION CLASSIFICATION FOR THE GPTM-1KE/( )

Operating Mode	Abbreviation	Emission Code
Continuous Wave	CW	A1
Amplitude Modulation Equivalent	AME	A3H
Pilot Carrier	PC	A3A
Modulated Continuous Wave	MCW	A2H
Upper Sideband	USB	A3J
Lower Sideband	LSB	A3J
Independent Sideband	ISB	A3B
Frequency Shift Keying	FSK	F4 (optional)

1-2. PHYSICAL DESCRIPTION

All of the components of the transmitter are housed in a standard 19 inch equipment cabinet four feet high. Each unit is designed to be slide mounted in the cabinet. Blank panels are furnished to cover the unused front panel area. The Model AX5192 Circuit Breaker Panel is mounted in the lowest rack position.

The transmitter will operate from a power source of 115 or 230 volts at 50 oh 60 Hz. It is factory wired to accommodate the power supply specified by the customer.

The GPTM-1KE/( ) is a manually tuned and operated unit. However, the internal cabling and the wiring of each of the components is such that with minor additions the transmitter could be automated.

All of the controls and indicators are, for efficient operation, located on the front panels of the units. The connections for input signals and system interconnections are made at the rear of each unit or at the interface panel at the rear of the transmitter cabinet.

1-3. REFERENCE DATA

The technical characteristics of the GPTM-1KE/( ) transmitter are shown in table 1-2. Table 1-3 lists the power amplifying tube complement of the system.

TABLE 1-2. TECHNICAL SPECIFICATIONS

Operating Frequencies:	Preselected between 2.0 and 30.0 MHz on eight crystal controlled channels.
Frequency Stability:	Maximum deviation is ±10 Hz over an ambient temperature range of 0 to 50°C with temperature controlled crystal oscillators.
Modes of Operation:	Eight switch selected modes as shown in table 1-1. FAX may be added
Power Output:	1000 watts PEP or 500 watts average.
Output Impedance:	50 ohms, unbalanced.
VSWR:	Maximum of 2:1 without performance degradation.
Tuning:	Manual

TABLE 1-2. TECHNICAL SPECIFICATIONS (cont)

ALDC:	Automatic Load and Drive Control circuit improves linearity, limits distortion, and maintains a relatively constant output level during high modulation peaks and load changes.
Spurious Response:	At leat 50 db down from full PEP output.
Power Requirement:	Approximately 1.8 KW (dependent on optional equipment incorporated) at 115/230 volt, single phase, 50/60 Hz.
Environmental Limitations:	Operating -0 to 50°C with up to 90 percent humidity. Storage -40 to 80°C and up to 95 percent humidity.
Features:	Safety interlocks, overload protection, fused power inputs, forced air cooling, monitored inputs and outputs.
Size:	23 inches wide, less than 4-1/2 ft. high, 2-1/2 ft. deep (max.). Mounted in customer selected standard cabinet.
Weight:	Less than 200 pounds. Actual weight depends on optional equipment incorporated.

TABLE 1-3. TUBE COMPLEMENT

Unit	Reference Designation	Part Number or Type	Function
HFL-100	V101	12HG7*	1st Amplifier
	V102	12HG7*	2nd RF Amplifier
	V103	4CX350	3rd RF Amplifier
TMA-1K	V101	8163*	Power Amplifier
	V102	8163*	Power Amplifier

* Operated in parallel

1-4. OTHER PUBLICATIONS

Technical manuals have been prepared for the several individual units which comprise the Model GPTM-1KE/( ) transmitter. Perusal of these publications prior to working with or on the transmitter is strongly recommended. Specific detail pertinent to the installation, operation or repair of the modular units is often only found in these presentations.

SECTION 2

INSTALLATION

2-1. RECEIVING AND INSPECTION

Experienced personnel in the TMC test facility have ascertained that the GPTM-1KE( ) met all operational requirements prior to shipment. The transmitter was then partially disassembled and the modular units separately packed. Separate packaging increases the ease with which the transmitter components are handled and reduces the possibility of damage in transit. Fragile parts, power amplifier tubes, for instance, are often removed and afforded special protection. Wiring harnesses are usually secured to the interior of the cabinet.

Upon arrival at the installation site the contents of each crate or carton should be carefully examined to be sure that the equipment sustained no damage in shipping. A claim against the carrier should be filed if damage for which he is responsible is discovered. Assistance in rectifying such damage will be provided by The Technical Materiel Corporation by describing repair methods and recommending replacement parts.

A packing list is provided with each shipment. Review it carefully to be certain that all material has been received. Carefully inspect all packing material so that no parts or equipment such as hardware, cables or connectors are discarded.

To minimize installation effort when delivery can be affected by TMC, the transmitter is on occasion shipped as an entity. In such cases the unpacking and assembly work is eliminated.

Each of the units should be extended on the slide mountings, the covers removed and a visual inspection conducted. Make certain that the amplifier tubes are set firmly in their sockets, and that all connectors and terminal board connections are secure.

2-2. POWER REQUIREMENTS

The transmitter will operate from a 115 or a 230 volt single phase power source. Each unit is factory wired to accommodate the voltage level indicated by the customer. A change in source voltage level will require that the transformer primary windings be rewired. The internal interconnection diagram in the unit technical manuals show the necessary wiring changes which should be made prior to installation. The protective fuses must also be changed. The power source must be capable of supplying up to 1.8 kw.

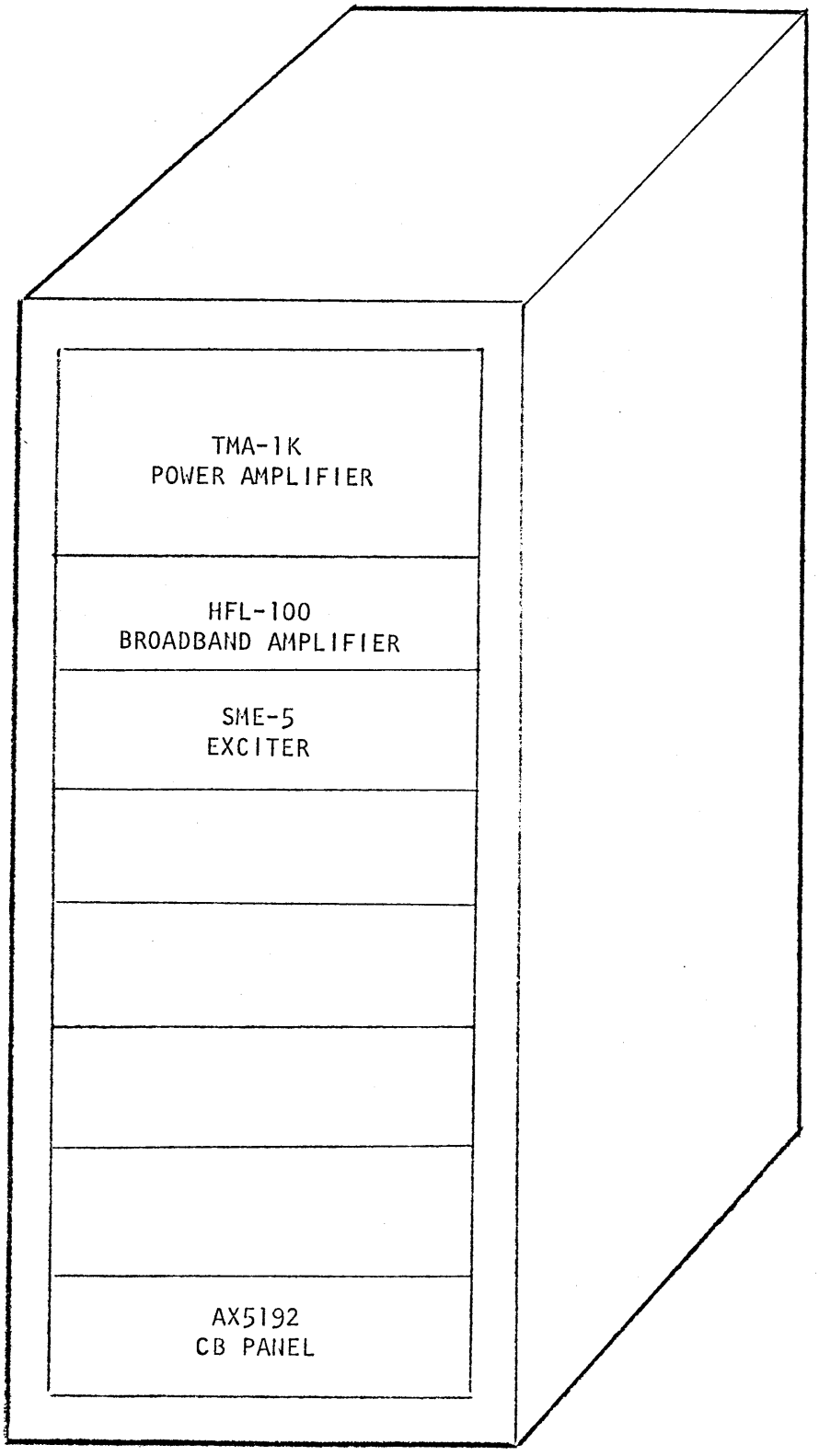

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Figure 2-1. Modular Component Location
Model GPTM-1KE/( )

2-3. INITIAL INSTALLATION

a. GENERAL DISCUSSION. Due consideration must be given as to the placement of the transmitter cabinet. Since the GPTM-1KE/( ) is an air-cooled system adequate ventilation must be provided. Convenience of operation and the relationship to associated equipment must also be considered. Clearance to allow the modular units to be extended on the slide mountings and easy access to the rear of the transmitter are necessary.

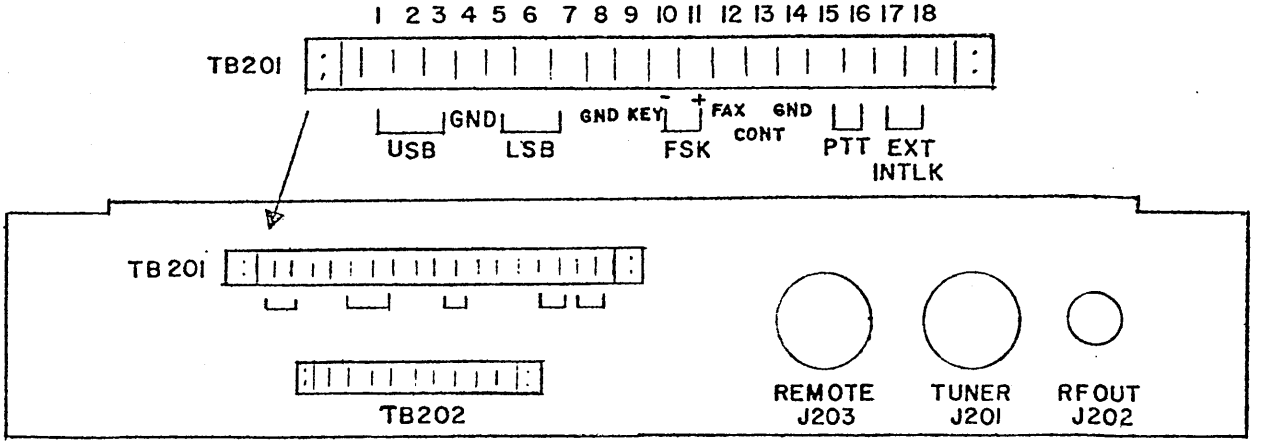
Before starting to reassemble the transmitter all packing material should be removed from the cabinet and wiring harness.

b. UNIT INSTALLATION. The tracks for the slide mountings which support the modular components of the transmitter are already mounted in the cabinet. It is therefore, a simple task to slide the units into the correct position as shown in figure 2-1.

The circuit breaker panel is not usually disassembled from the cabinet nor are the blank panels which occupy the space of unincorporated optional equipment. Care must be exercised when positioning the units to avoid any entanglement with installed wiring. When the units are in place, they should be firmly secured by means of the panel locks, or with the mounting hardware supplied.

c. ELECTRICAL CONNECTIONS. A standard wiring harness has been installed in the GPTM-1KE/( ) cabinet. This harness makes provision for the installation of the available optional equipment most commonly added to the basic transmitter configuration, namely an ATSA-3 Antenna Tuning System and a TIS Tone Intelligence System. If not initially incorporated, these equipments can be easily added at a later date with a minimum of additional wiring. The harness connections are shown in figure 2-2.

An interface panel mounted at the rear of the transmitter cabinet is provided to support the mating jacks for unit interconnections and for most of the external connections to be made to the transmitter. The layout of this panel showing the locations of these connections is shown in figure 2-3.



WARNING

BEFORE MAKING ANY ELECTRICAL CONNECTIONS TO THE TRANSMITTER BE CERTAIN THAT NO CONNECTION HAS BEEN MADE TO ANY POWER SOURCE AND THAT THE POWER SUPPLY JACK IS TAGGED TO PREVENT ACCIDENTAL USE.

(1) Internal Connections. Reference to the internal interconnection diagram, figure 2-2, will assist the installer in properly making the connections required. The terminal boards and jacks at the rear of the modular units have been marked with the appropriate "TB" or "J" number. Connectors on the wiring harness have been similarly identified. Check the numbers carefully for, unless all optional equipment is installed, some connectors will not be used.

(2) External Connections. After completing all of the external connections described in the paragraphs which follow, primary power must be supplied to the transmitter through the connector located at the lower left rear corner of the equipment cabinet. A plug (PL190-NG) which mates with this connector is furnished as a "loose item" to facilitate the fabrication of this power cable.

Mating connectors for the terminal boards and jacks on the interface panel where the external connections to the transmitter are made are also furnished as "loose items". These items are used to terminate the control and signal cables which must be fabricated by the customer.

The customer fabricated cabling carrying the operational and control signals terminates at TB201 and TB202 on the interface panel. Shielded wire (except as noted) should be used to fabricate this cable. The proper connections are shown in table 2-1.

TABLE 2-1. CONNECTIONS TO TERMINAL BOARD TB201

Terminal No.	Signal Input
1	Upper Sideband (600 ohm)
2	----
3	Upper Sideband (600 ohm)
4	Shields (ground)
5	Lower Sideband (600 ohm)
6	----

TABLE 2-1. CONNECTIONS TO TERMINAL BOARD TB201 (cont)

Terminal No.	Signal Input
7	Lower Sideband (600 ohm)
8	Ground
9	CW key
10	FSK (-)
11	FSK (+)
12	-------
13	Keyed Ground
14	Ground
15	PTT (need not be shielded)
16	PTT ground (need not be shielded)
17	External interlocks (need not be shielded)
18	External ground (need not be shielded)

If an antenna tuning system is to be made part of the transmitter, a cable to carry the control signals from the transmitter to the tuning unit at the antenna base must be installed. This cable may be purchased from TMC or customer fabricated. Reference to the interconnection diagram, figure 2-2, and to the technical manual for the antenna tuning system will enable the installer to make this connection correctly.

2-4. FINAL INSPECTION

After all electrical connections have been completed the transmitter should be visually inspected to be sure of the following:

a. The interlocks are operable. The interlocks on the GPTM-1KE/( ) transmitter are located on the TMA-1K linear power amplifier unit, and must close when the top and bottom protective covers are secured in place.

b. All electrical connections have been properly made and that the connectors are mechanically secure in the correct positions.

c. The protective top and bottom cover are securely affixed to each modular unit and that the units are secured in the cabinet with panel locks or mounting hardware.

d. The rear cabinet panel is in place and secured with the mounting hardware provided.

e. The antenna system or equivalent dummy load is properly connected to the rf output connector of the transmitter system.

C.B. PAN

P/O INTFC

J204

1 2

3 4

S301

J204-A

J204-B

J301 SME-5 P4 - C TMA J101-Y

TMA J101-X
SME J14-A
J204
J301

AC
J301

LINE INPUT
J204

A B C

S103-1

BREAKER
S103-3

RF OUT

J202

TMA P105

TB

1 INTFC J203-h
2 INTFC J203-k
3 INTFC J203-m
4 INTFC J203-n
5 INTFC J203-

AX5

AX

C

J104

AX5175 P107-A	A
	B
AX5175 P107-C	C
AX5175 P107-D	D
AX5175 P107-E	E
AX5175 P107-F	F
AX5175 P107-G	G
AX5175 P107-H	H
AX5175 P107-J	J
AX5175 P107-K	K
AX5175 P107-L	L
AX5175 P107-M	M
AX5175 P107-N	N
AX5175 P107-P	P
AX5175 P107-R	R
AX5175 P107-S	S
AX5175 P107-T	T
AX5175 P107-U	U
AX5175 P107-V	V
AX5175 P107-W	W
AX5175 P107-X	X
AX5175 P107-Y	Y
AX5175 P107-Z	Z
AX5175 P107-a	a
AX5175 P107-b	b
AX5175 P107-c	c
AX5175 P107-d	d
AX5175 P107-e	e
AX5175 P107-f	f
AX5175 P107-g	g
TMA-1K E101-5 AX5175 P107-h	h
AX5175 P107-j	j
AX5175 P107-k	k
AX5175 P107-m	m
AX5175 P107-n	n
AX5175 P107-p	p
AX5175 P107-r	r
AX5175 P107-s	s

I/O INTFC

TB201
(E 201)

USB	1	SME-5	E103-1
	2	E103-2	
	3	SME-5	E103-3
GND	4		
	5	SME-5	E103-7
LSB	6		
	7	SME-5	E103-9
GND	8	SME-5	E104-8
KEY	9	SME-5	E105-2
	10	SME-5	E104-5
FSK	11	SME-5	E104-6
	12		
CONT	13	SME-5	E104-1
GND	14		
	15	SME-5	E105-7
PTT	16	SME-5	E105-8
		HFL-100 E102-1 INTFC J203-8	
	17	TMA-1K E101-18	
	18	GND	

EXT INTK

J201

SME-5 E105-7	A
SME-5-P105-H	B
SME-5 P115-A	C
SME-5 P115-B	D
SME-5 P115-C	E
SME-5 P115-D	F
SME-5 P115-E	G
SME-5 P115-F	H
SME-5 P115-G	J
SME-5 P115-H	K
SME-5 P115-J	L
SME-5 P115-K	M
SME-5 P115-L	N
SME-5 P115-M	P
SME-5 P115-N	R
SME-5 P115-P	S
SME-5 P115-R	T
SME-5 P115-S	U
SME-5 P115-T	V
SME-5 P115-U	W
SME-5 P115-V	X
SME-5 P115-W	Z
SME-5 P115-J	a
SME-5 P115-Z	b
TMA-1K E101-3	c
TMA-1K E101-4	d
TMA-1K E101-6	e
HFL-E102-13	f
TMA E101-16	g
INTFC TB202-1	h
INTFC TB202-5	j
INTFC TB202-2	k
INTFC TB202-3	m
INTFC TB202-4	n
TMA-1K P103-1	P
TMA-1K P103-9	r
	s

PTT	A
PTT IND	B
CHANN-1	C
CHANN-2	D
CHANN-3	E
CHANN-4	F
CHANN-5	G
CHANN-6	H
CHANN-7	J
CHANN-8	K
PC	L
AME	M
CW	N
SSB	P
L1	R
L2	S
MIC/CW	T
FSK	U
L1	V
L2	W
MIC/CW	X
FSK	Z
MCW	a
COM (GND)	b
RDY	c
FAULT	d
TUNE	e
HV RDY	f
HV ON	g

110 AC

INTFC E201-6
INTFC E201-5
INTFC E201-13
SHIELD
INTFC E201-9
AX P106-W
GND
TR RELAY
INTFC E203-A
INTFC E201-15
INTFC E201-16
TMA-1K E101-15
TMA-1K E101-14
TMA-1K E101-17
TMA-1K E101-12
TMA-1K E101-11
TMA-1K E101-1
TMA-1K E101-6
INTFC J203-E
TMA-1K E101-8
TMA-1K E101-1
AX P106-U

SME-5

HFL-100

E102 TB1

1 L1
2
3
4 L(BAND) MIC
5 F/S BAND MIC
6 MIC
7
8 L2
9

E104 TB2

1 KEYED GND
2 +6V
3 GND
4 +50V
5
6
7 +100V
8 GND
9

E105 TB3

1
2 CW KEY
3 SSB
4 REMOTE
5 COM
6 TRANSMIT
7 PTT
8

P105 J120

A 2-2.6
B 2.6-3
C
D 3-8 BAND
E 8-12
F 12-16
G 16-24
H A19-64
J 24-30
K
L
M S4C W

J128 P114

RF OUT — HFL P101

J119 P115

CHANN 1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 H

MODE: MCW I, PC J, AME K, CW L, SSB M

LSB: LI N, L2 P, MIC-CW R, FSK S

USB: LINE 1 T, LINE 2 U, MIC-CW V, FSK W

COM Z

INTFC J203-C
INTFC J203-D
INTFC J203-E
INTFC J203-F
INTFC J203-G
INTFC J203-H
INTFC J203-J
INTFC J203-K
INTFC J203-B
INTFC J203-L
INTFC J203-M
INTFC J203-N
INTFC J203-P
INTFC J203-R
INTFC J203-S
INTFC J203-T
INTFC J203-U
INTFC J203-V
INTFC J203-W
INTFC J203-X
INTFC J203-Z
INTFC J203-D

P104

J14 AC IN — A, B, C — S301-4, GND, S301-2

P113

J127 ALDC IN — TMA J101

P101 J101

SME-5 P129 — RF IN

J102

DC (OPTION)

E104 TB101

INTFC E201-17
TMA-1K E101-2
TMA-1K E101-6 AX P106-K
AX P106-4
TMA-1K E101-5
TMA-1K E101-9
TMA-1K E101-10
TMA-1K E101-11
TMA-1K E101-12
TMA-1K E101-13
TMA-1K E101-14
TMA-1K E101-15
INTF J203-f
TMA-1K E101-4
TMA-1K E101-16
TMA-1K E101-18

1 KEY INTLK
2 DRIVE UP
3 TUNE
4 PTT
5
6
7
8 } BAND
9
10
11
12
13 H V RDBK
14 STBY
15 H V DELAY
16 REMOTE OR HV ON RE INTLK

J203

P110

TMA-1X

J103 P111

RF OUT

TMA J103

V ON REMOTE

P109 J103

HFL P111

RF IN

J104 P112

ALDC OUT

SME P127

E101 TB101

SME-5 P105-J	1	TUNE CAR
HFL-100 E102-2	2	DRIVE UP
INTFC J203-5	3	FINAL READY
INTFC J203-4	4	FAULT
HFL E102-14	5	TRIG DELAY
HFL-100 E102-3 INTFC J203-6	6	TUNE
	7	
SME-5 P105-I	8	24-30
SME-5 P105-G	9	16-24
SME-5 P105-F	10	12-16
SME-5 P105-E	11	8-12
SME-5 P105-D	12	5-8
SME-5 P105-C	13	3-5
SME-5 P105-B	14	2.6-3
HFL-100 E102-13 SME-5 P105-A	15	2-2.6
HFL-100 E102-15	16	HV DELAY
	17	+24V
INTFC E201-17 HFL-100 E102-16	18	REMOTE OR HV ON REMOTE

ATS BAND

BAND

J102 P102

1	INTF J203 P
2	AX P106-A
3	AX P106-B
4	AX P106-C
5	AX P106-D
6	AX P106-E
7	AX P106-F
8	AX P106-G
9	AX P106-H
10	INTFC J203-K AX P106-L
11	AX P106-M
12	

J105 P205

RF OUT

INTFC J202

J101

GND

Y

W

X

AC

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	E.M.
	X	EXP RELEASE	4-1-75	

AX5175 [illegible]

J104 P112

ALDC OUT

SME P127

J102 P102

1	INTF J203 P
2	AX P106-A
3	AX P106-B
4	AX P106-C
5	AX P106-D
6	AX [illegible]
7	AX [illegible]
8	AX P106-G
9	AX P106-H
10	INTFC J203-[illegible] AX P106-L
11	AX P106-[illegible]
12	

ATS BAND

ON REMOTE

J105 P205

RF OUT

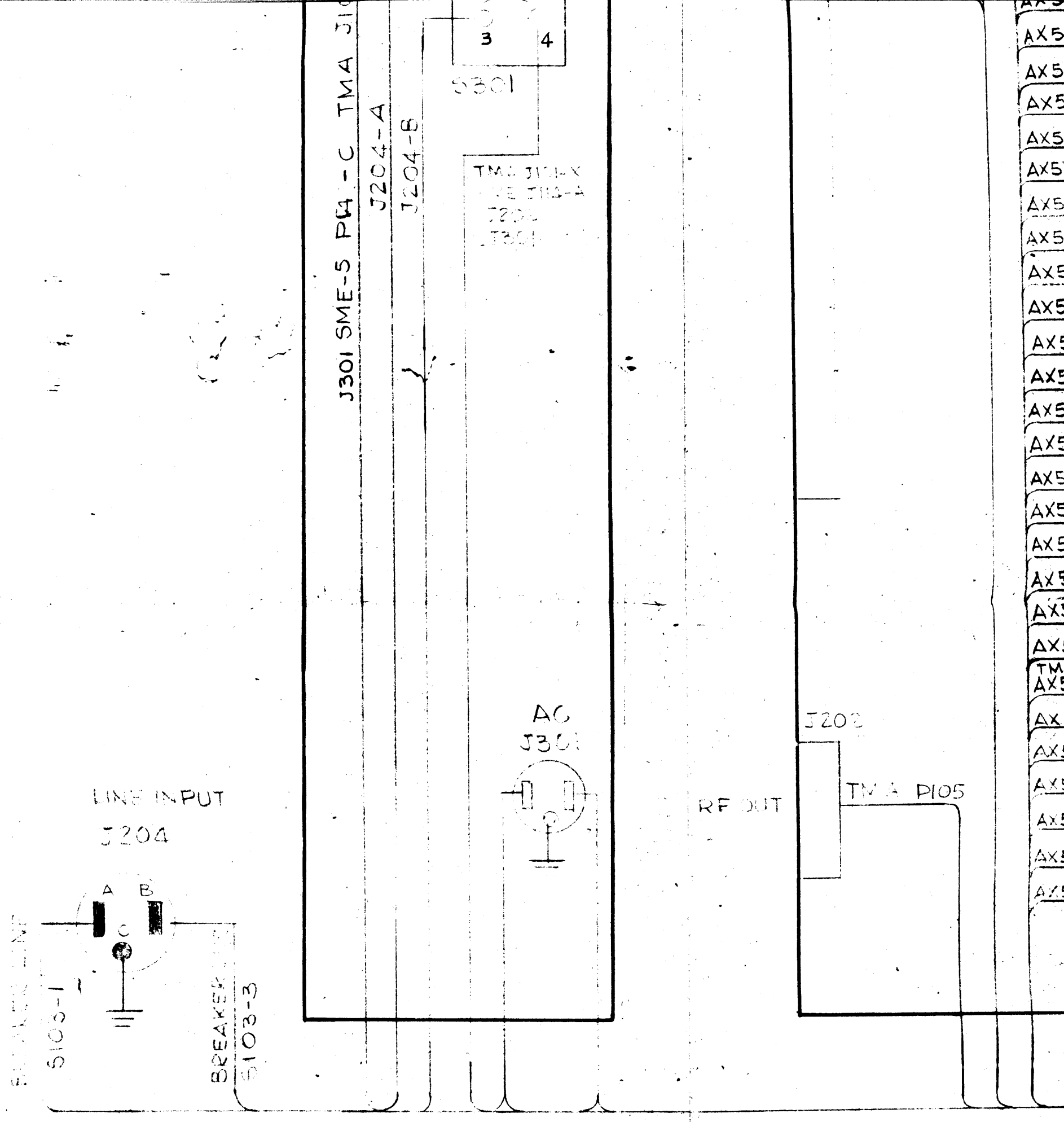
INTFC J202

P103 J103

A	INTFC J103-A
B	
C	INTFC J103-C
D	INTFC J103-D
E	INTFC J103-E
F	INTFC J103-F
G	INTFC J103-G
H	INTFC J103-H
J	INTFC J103-J
K	INTFC J103-K
L	INTFC J103-L
M	INTFC J103-M
N	INTFC J103-N
P	INTFC J103-P
R	INTFC J103-R
S	INTFC J103-S
T	INTFC J103-T
U	INTFC J103-U
V	INTFC J103-V
W	INTFC J103-W
X	INTFC J103-X
Y	INTFC J103-Y
Z	INTFC J103-Z
a	INTFC J103-a
b	INTFC J103-b
c	INTFC J103-c
d	INTFC J103-d
e	INTFC J103-e
f	INTFC J103-f
g	INTFC J103-g
h	INTFC J103-h
j	INTFC J103-j
k	INTFC J103-k
m	INTFC J103-m
n	INTFC J103-n
p	INTFC J103-p
r	INTFC J103-r
s	INTFC J103-s

T[illegible] P[illegible]

A	[illegible] P102-2
B	TMA-1K P102-3
C	TMA-1K P102-4
D	TMA-1K P102-5
E	TMA-1K P102-6
F	TMA-1K P102-7
G	TMA-1K P102-8
H	TMA-1K P102-9
J	
K	
L	TMA-1K P102-11
M	GND
N	RF-[illegible] P204
P	P204
R	P204
S	GND
T	SME-S P105-H
U	SME-S P105-M
V	
W	SME-S P105-4


J301 SME-5 P4 - C TMA J1
J204-A
J204-B
3
4
S301
TMA J1
J2
J3
AC
J301
J202
TM A P105
RF OUT
LINE INPUT
J204
A
B
C
S103-1
S103-3
BREAKER

AX5175 P107-L
AX5175 P107-M
AX5175 P107-N
AX5175 P107-P
AX5175 P107-R
AX5175 P107-S
AX5175 P107-T
AX5175 P107-U
AX5175 P107-V
AX5175 P107-W
AX5175 P107-X
AX5175 P107-Y
AX5175 P107-Z
AX5175 P107-a
AX5175 P107-b
AX5175 P107-c
AX5175 P107-d
AX5175 P107-e
AX5175 P107-f
AX5175 P107-g
TMA-1K E101-5
AX5175 P107-h
AX5175 P107-j
AX5175 P107-k
AX5175 P107-m
AX5175 P107-n
AX5175 P107-p
AX5175 P107-r
AX5175 P107-s

L
M
N
P
R
S
T
U
V
W
X
Y
Z
a
b
c
d
e
f
g
h
j
k
m
n
p
r
s

LSB
GND
KEY
FSK
CONT
GND
PTT
EXT INTK

7 SME-5 E103-9
8 SME-5 E104-8
9 SME-5 E105-2
10 SME-5 E104-5
11 SME-5 E104-6
12
13 SME-5 E104-1
14
15 SME-5 E105-7
16 SME-5 E105-8
17 TMA-1K E101-18
18 GND

SME-5 P115-L
SME-5 P115-M
SME-5 P115-N
SME-5 P115-P
SME-5 P115-R
SME-5 P115-S
SME-5 P115-T
SME-5 P115-U
SME-5 P115-V
SME-5 P115-W
SME-5 P115-J
SME-5 P115-Z
TMA-1K E101-3
TMA-1K E101-4
TMA-1K E101-6
HFL-E102-13
TMA E101-16
INTFC TB202-1
INTFC TB202-5
INTFC TB202-2
INTFC TB202-3
INTFC TB202-4
TMA-1K P102-1
TMA-1K P115-J

PC
AME
CW
SSB
L1
L2
MIC/CW
FSK
L1
L2
MIC/CW
FSK
MCW
COM (GND)
RDY
FAULT
TUNE
HV RD BK
HV ON
NO AC

SHIELD
SHIELD
E105
INTF E201-9
GND
P105
TMA-1K E101-15
TMA-1K E101-14
TMA-1K E101-13
TMA-1K E101-12
TMA-1K E101-11
TMA-1K E101-10
TMA-1K E101-9
INTFC J203-E
TMA-1K E101-8
TMA-1K E101-1

1 KEYED GND
2 +6V
3 GND
4 +50V
9

E105 TB3

1 CW KE
2 GND
3 REMOTE
4 COM
TRANSMIT
PTT

P105 J120

A 2-2.6
B 2.6-3
C
D 5-9
E 9-12
F 12-16
16-24
A 19-24
24-30
M S4C W

CHAN B H

MODE
MCW I
PC J
AME K
CW L
SSB M

LSB
LI N
L2 P
MIC-CW R
FSK S

USB
LINE 1 T
LINE 2 U
MIC-CW V
FSK W
COM Z

J14
AC IN

P104
A
B
S301-4
GND
S301-2

P103
J14
AUDIO IN
TMA-K E101-

INTFC J203-H
INTFC J203-J
INTFC J203-K
INTFC J203-B
INTFC J203-L
INTFC J203-M
INTFC J203-N
INTFC J203-P
INTFC J203-R
INTFC J203-S
INTFC J203-T
INTFC J203-U
INTFC J203-V
INTFC J203-W
INTFC J203-X
INTFC J203-Z
INTFC J203-b

TMA-K E101-2
TMA-K E101-6
AX P106-K
AX P106-4
TMA-K E101-5
TMA-K E101-9
TMA-K E101-10
TMA-K E101-11
TMA-K E101-12
TMA-K E101-13
TMA-K E101-14
TMA-K E101-15
INTF J203-f
TMA-K E101-4
TMA-K E101-16
TMA-K E101-18

2 DRIVE UP
3 TUNE
4 PTT
5
6
7
8
9
10
11
12 2-2.6
13 H V RDBK
14 STBY
15 H V DELAY
16 REMOTE OR HV ON RE INTLK

BAND

J201
P110

V ON REMOTE

HFL-100 E102-15

INTFC E201-17
HFL-100 E102-16

2	DRIVE UP	
3	FINAL READY	
4	FAULT	
5	TRIG DELAY	
6	TUNE	ATS BAND
7		
8	24-32	BAND
9	16-24	
10	12-16	
11	8-12	
12	5-8	
13	3-5	
14	2.6-3	
15	2-2.6	
16	HV DELAY	
17	+24V	
18	REMOTE OR HV ON REMOTE	

J105 P205

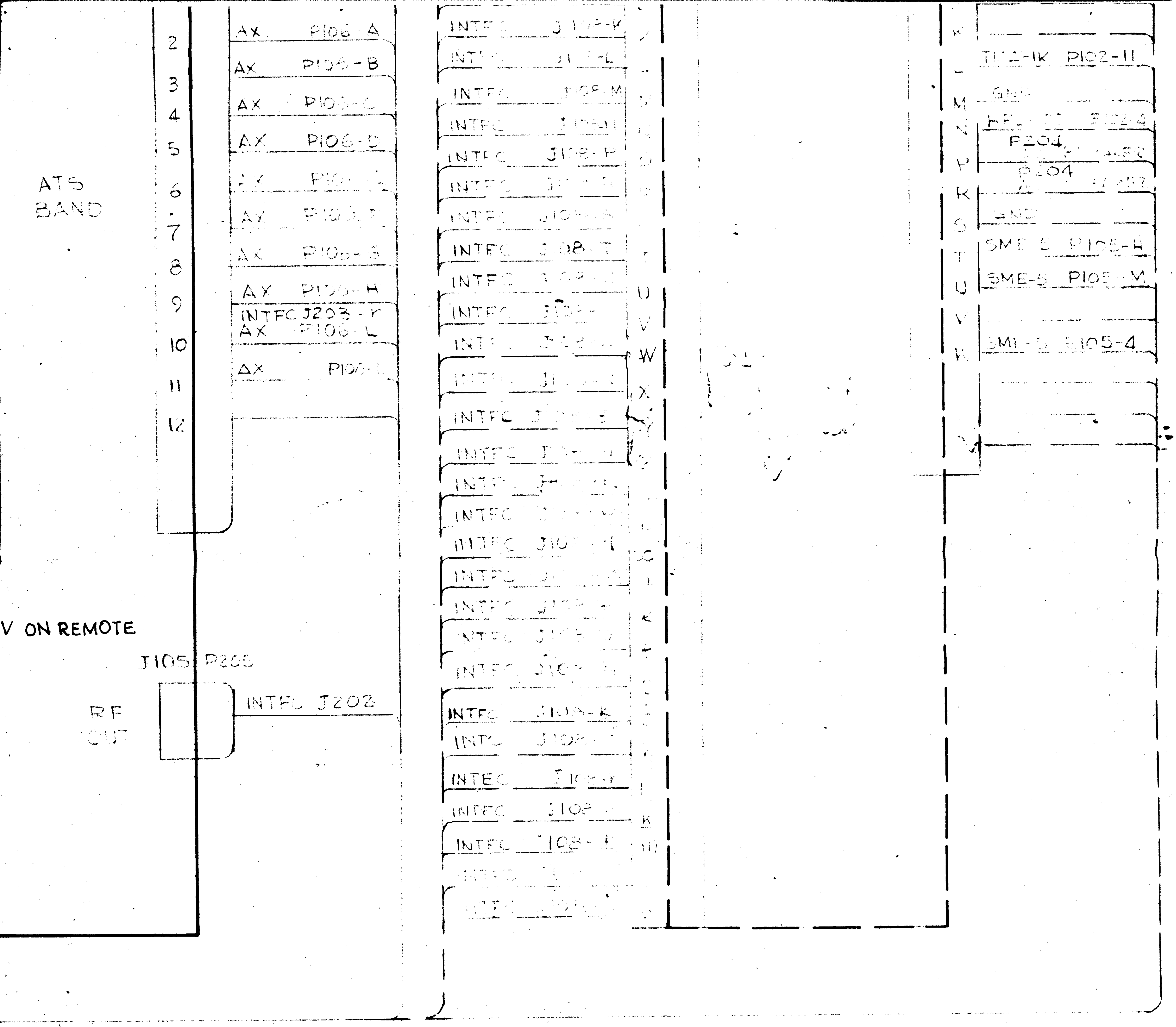
RF OUT

INTFC J202

J1[illegible]

GND

QTY. REQ.	
FINAL AP	
MECH. D	
ELECT. D	
CHECKED	
DRAWN	



QTY. REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
LIST OF MATERIAL				

FINAL APPROVAL	DATE	**THE TECHNICAL MATERIEL CORP.** MAMARONECK, NEW YORK
MECH DES	DATE	
ELECT DES	DATE	
CHECKED	DATE	Figure 2-2. Interconnect Wiring Diagram, Model GPTM-1KE/( )
DRAWN G. DeLUCIA	DATE 3- 75	

SECTION 3

OPERATORS SECTION

3-1. INTRODUCTION

The GPTM-1KE/( ) transmitter will provide one kilowatt PEP (peak envelope power) or 500 watts average power in any of eight operating modes. This section gives instructions for tuning, operating and monitoring the transmitter. These instructions consider only the basic transmitter. Should any of the available optional equipment be added the procedures must be modified to include the operation of the additional units. Reference to the individual technical manuals for the added equipment will assist the operator in making these modifications.

3-2. OPERATING CONTROLS AND SEQUENCE

The individual technical manual for each modular component of the transmitter shows the location and function of each control and indicator. The operator must be knowledgeably familiar with this information before attempting to adjust or operate the GPTM-1KE/( ).

These instructions present an approved sequence of operation. It is important that such a sequence be habitually followed to prevent undue stress on system components.

3-3. PRELIMINARY CONTROL SETTINGS

Before applying any power to the transmitter the operator must be certain that the antenna or suitable dummy load is connected to the rf output connector (J202 on the interface panel). The position of the controls in accordance with table 3-1 must be verified by the operator as the first step in transmitter use.

TABLE 3-1. PRELIMINARY CONTROL SETTINGS

Modular Unit	Control	Setting
Circuit Breaker Panel	Main Circuit Breaker	ON
SME-5	UPPER SIDEBAND	OFF
	LOWER SIDEBAND	OFF
	MODE	CW
	CHANNEL	any
	ON/OFF switch	ON

TABLE 3-1. PRELIMINARY CONTROL SETTINGS (cont)

Modular Unit	Control	Setting
HFL-100	AC ON/OFF switch	OFF
	LOCAL/REMOTE switch	LOCAL
	HV ON/OFF switch	OFF
	IP/RF switch	IP
	RF GAIN	fully counterclockwise
TMA-1K	MANUAL/AUTO/REMOTE switch	MANUAL
	AC switch	down position (off)
	HV switch	down position (off)

3-4. OPERATING PROCEDURE

The GPTM-1KE/( ) is a manually tuned transmitter. The tuneable components of the unit are adjusted by the operator to accommodate the selected carrier frequency and to achieve a resonant condition. The efficient operation of the transmitter depends in a large measure upon the skill and technical understanding of the operator. Only experienced operators with an intimate knowledge of the GPTM-1KE/( ) should attempt to use the transmitter. Table 3-2 gives the procedural steps necessary to tune the transmitter.

TABLE 3-2. MANUAL TUNING PROCEDURE

Step No.	Modular Unit	Operation	Normal Indication
1	SME-5	Select operating frequency with CHANNEL selector switch.	Index on knob indicates channel selected.
2	SME-5	Select operating mode with MODE selector switch.	Index on knob indicates mode selected.
3	SME-5	If applicable adjust UPPER SIDEBAND and LOWER SIDEBAND switches to accommodate intelligence inputs.	Index on knob indicates selection.
4	HFL-100	Set LOCAL/REMOTE switch to LOCAL.	Index on knob indicates selection.
5	TMA-1K	Set MANUAL/AUTO/REMOTE switch to MANUAL.	Index on knob indicates selection.

TABLE 3-2. MANUAL TUNING PROCEDURE (cont)

Step No.	Modular Unit	Operation	Normal Indication
6*	CB Panel	Set circuit breakers to ON position.	AC indicator lamp lights.
7	HFL-100	Set AC switch to ON position.	AC indicator lights.
8	TMA-1K	Set AC switch to up position (on).	AC indicator lights. Band indicator lights.
9*	SME-5	Set ON/OFF switch to ON.	POWER indicator lamp lights.
		CAUTION Allow sufficient time for tube filiments to heat (at least one minute) before proceeding.	
10	HFL-100	Set HV switch to ON position.	HV indicator lamp lights. IP meter indicates 50-70ma.
11	HFL-100	Press and release the BAND pushbutton sequentially until bandswitch is positioned properly for the selected operating frequency.	Band indicators light to indicate selected band.
12	TMA-1K	Press and release the BAND pushbutton sequentially until bandswitch is properly positioned for the selected operating frequency.	Band indicators light to indicate selected band.
		CAUTION Be certain that band selected is the one which will accommodate the operating frequency.	
13	TMA-1K	Set HV switch to up (on) position.	HV indicator lamp lights. IP meter indicates 300 ma.

TABLE 3-2. MANUAL TUNING PROCEDURE (cont)

Step No.	Modular Unit	Operation	Normal Indication
14	TMA-1K	Operate the TUNE lever switch to obtain the required normal indication.	OUTPUT meter indicates the highest obtainable output (peak) when resonance is achieved.
		NOTE A peak reading on the OUTPUT meter should be accompanied by a decrease (dip) in the magnitude of the plate current as indicated on the IP meter. The transmitter is then ready for transmission of intelligence. The operator must determine, by the observation of normal indications, that the transmitter is properly tuned. Refer to paragraph 3-5 for intelligence operation.	
15	TMA-1K	Adjust the ALDC control so that maximum allowable output is not exceeded.	OUTPUT meter indicates average rf output power.
		*NOTE Except for the initial start up or if the transmitter has been completely shut down for an extended period of time steps 6 and 9 of table 3-2 are not required. Good operating practice dictates that power be continually supplied to the SME-5 exciter so that the crystal controlled oscillators be stabilized.	

This completes the manual tuning sequence.

3-5. OPERATING PROCEDURES FOR INTELLIGENCE MODE

Once the GPTM-1KE/( ) transmitter has been tuned it may be operated at full power in any operating mode. The mode and power level at which it is operated is determined by the type of intelligence to be transmitted and by local conditions. In any case, neither the 500 watt average power limit, nor the 1 Kw PEP limit should be exceeded. Thus in CW and FSK modes of operation the average power rating is the limiting factor since only a single tone is being transmitted. However, in the sideband modes with multi-tone or voice transmission the average output power must be reduced to maintain the PEP rating.

As shown graphically and by formula in figure 3-1, as the number of transmitted tones is increased, the average power must be decreased if the PEP limitation is to be met. In making this computation it was assumed that all tones were in phase, which in actual practice does not happen. With certain intelligence, the repetition rate of the peak envelope can be determined as can the ratio of average power to peak envelope power. With most intelligence however, the peaks occur at a random rate and at random amplitude. In actual practice the normal ratio of peak to average power is about 4 or 5 to 1 in sideband transmission.

The ALDC circuit, which is a feature of TMC transmitters, allows the operator to transmit as much average power as possible, while limiting the occasional high peaks of the envelope to a point within the capability of the transmitter at which a minimum of distortion is generated.

The average power, which is indicated on the OUTPUT meter, will necessarily vary with the operating mode and the type of intelligence being transmitted. That portion of the average power used to transmit the carrier frequency is determined by the amount of carrier suppression. In the CW, MCW, and FSK modes the transmission of the carrier is not suppressed; merely modulated or interrupted. The full average power, in this case 500 watts, may therefore be used for its transmission. In the AME mode the carrier is transmitted at a power level 6 db down from PEP or at 250 watts average. When transmitting in the pilot carrier mode 10 watts of power are used, as the carrier is suppressed to the 20 db level. In the suppressed carrier mode the transmission of the carrier is completely suppressed (-55 db) and consumes only three milliwatts of power.

That portion of the available power not used to transmit the carrier frequency is available to transmit intelligence. The nature of the intelligence being the determining factor. For example: a single sideband (A3J) transmission of two tones with the carrier fully suppressed (SUPP CARR mode) could be made at the 500 watt average power level without exceeding the PEP rating of the equipment. The more complex the intelligence input in terms of the number of tones to be transmitted the lower the average power indication on the OUTPUT meter should be.

Careful adjustments of the ALDC circuit and operator skill in adjusting the RF GAIN and input levels will ensure efficient operation with a minimum chance of equipment damage.

Before operating the transmitter in any intelligence mode, recheck the tuning as outlined in table 3-2. If the operating frequency is not to be changed, do not perform step 1 but check the channel setting. Step 6 through 13 of table 3-2 outline the procedure for applying power to the transmitter. Connect the external signal source to the transmitter. If a microphone is to be used set the VOX/PTT switch on the SME-5 exciter to the PTT position.

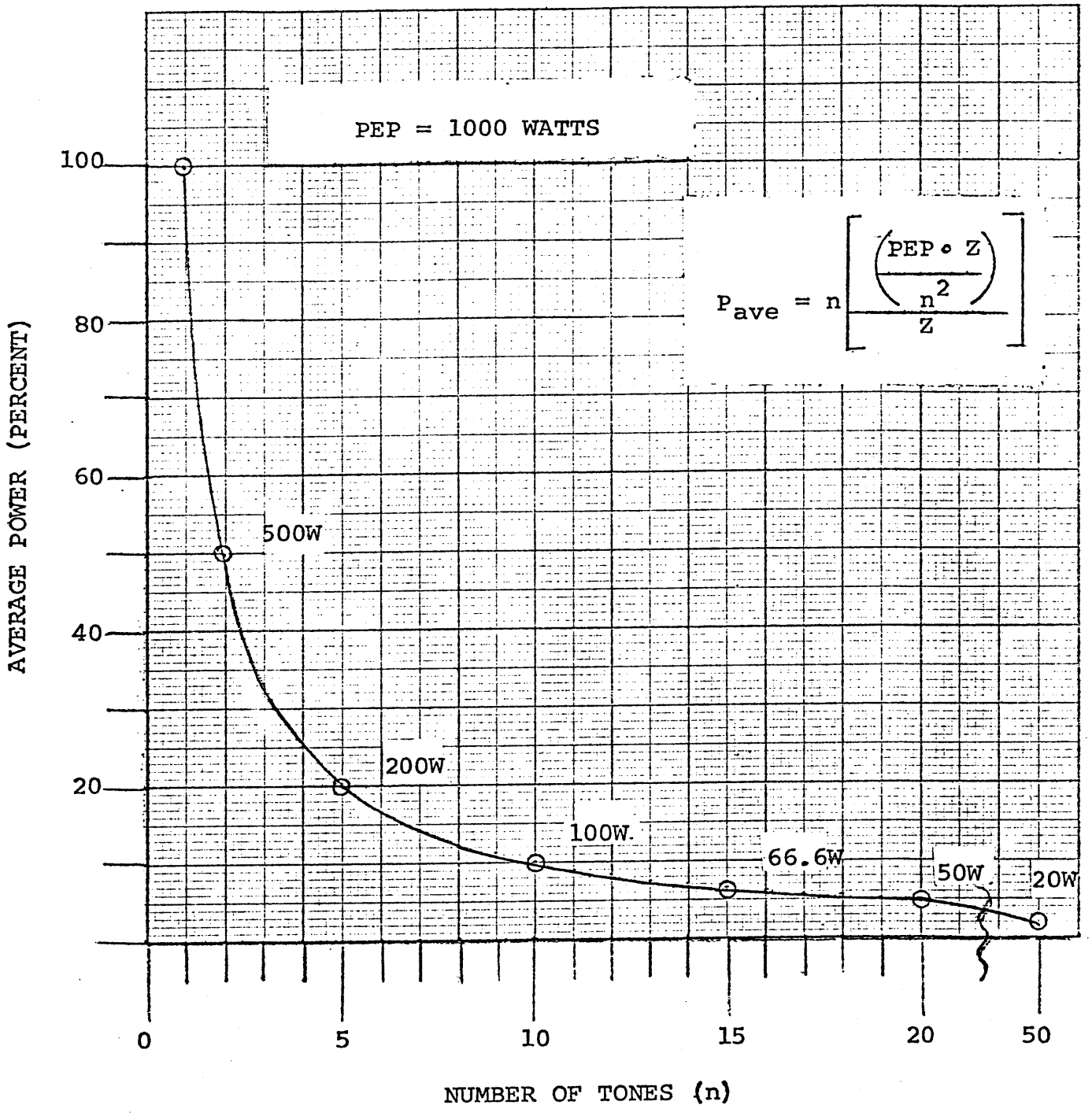


Figure 3-1. Ratio of Average Power to PEP as a function of tones

MONITORING THE TRANSMITTER

Perhaps the most practical method of ensuring that the design limits of the transmitter are not exceeded while making the most efficient use of the power available to transmit intelligence, is to monitor the rf voltage output of the transmitter. When a limit is established, under design conditions, for that voltage the transmitter may be operated in any sideband mode without placing undue stress on the components if the established limit is not exceeded.

It will be seen by reference to figure 3-1 that the design criteria for the maximum average power and PEP (500 watts average 1000 watts peak) is met when two tones are applied to the transmitter. Thus, if a sample of the output is measured through a voltage divider network on an oscilloscope under these conditions, a visual reference will be established indicative of the transmitter design limits.

A numerical reference representing the absolute value of PEP may similarly be established with the use of a peak reading vacuum tube voltmeter with the scale calibrated in terms of RMS value. The Hewlett-Packard Model 410B is such an instrument.

For example: Since Power (P) equals E^2/R, if R is constant P will vary as the square of the voltage. Then, if PEP (max) = 1000 volts and Emax = Reading on VTVM when two tones are applied (e.g. 10 volts) the actual peak envelope power (PEPa) at anytime may be calculated by taking a voltmeter reading (E_r) and using the following formula.

$$PEP(a) = \frac{PEP\ (max)}{\left(\frac{Emax}{Er}\right)^2}$$

Let us say that a reading of 8.75 is obtained on the voltmeter. The actual PEP of the transmitter at that time is:

$$PEP(a) = \frac{1000}{\left(\frac{10V}{8.75V}\right)^2}$$

$$= \frac{1000}{1.142}$$

$$= \frac{1000}{1.306} = 765.7 \text{ watts}$$

Note that the figure 10 volts in the foregoing example was used only to demonstrate the measuring principle. In practice the value would depend upon the design of the voltage divider network but the principle will remain the same.

3-6. OPERATORS MAINTENANCE

Day-to-day visual checks of the equipment will detect the most obvious defects; frayed cables, blown fuses, burned-out indicator lamps, cracked glass or broken knobs. A more thorough visual inspection including those components housed in the equipment cabinet should be made at regular intervals. Components showing signs of wear, aging or overheating should be noted and replaced if necessary. Accumulated dust or other foreign material should be removed. A regular program of operator care, and the repair or replacement of defective minor parts may prevent serious failures and unnecessary "downtime".

CAUTION

Replacement parts should be identical to the part being replaced to ensure proper operation.

At regularly scheduled intervals each of the units which comprise the transmitter should be removed from the cabinet and given a very thorough cleaning and inspection. Each unit should be tested individually as called for in the technical manual for the unit.

An effective preventive maintenance program will extend the life of the unit and provide prolonged periods of trouble-free service.