

**SOLID STATE 12 CHANNEL**

# **VHF FM TRANSCEIVER**

**TYPE; FM144-10L A** 4-FET, 6-IC, 16-Tr, 14-DIODE, 6-DIODE ARRAY

**TYPE; FM 50-10L A** 4-FET, 6-IC, 15-Tr, 14-DIODE, 6-DIODE ARRAY

## **INSTRUCTION MANUAL**



KYOKUTO DENSHI LTD.

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# 1. GENERAL

## A) CHANNEL SELECTION BY DIODE SWITCHING

Channel is selected by the silicon diode array system, without rotating the oscillator unit, resulting in excellent spurious characteristics. Channel selector can be remotely controlled.

## B) FETS AND AGC CIRCUIT

The RF amplifier of the receiving unit uses two FETs to constitute a cascode amplifier circuit. The first and second mixer circuits also use FET respectively. Furthermore, the AGC circuit which controls the RF amplifier reduces excessive input to the mixer circuit, thereby assuring excellent cross-modulation and adjoining signal characteristics.

## C) FILTER CIRCUIT

Two ceramic filters in the first IF amplifier, combined with LC, assure excellent band characteristics. The second IF amplifier uses a 9-element ceramic filter to provide sharp band characteristics.

## D) ICs

Reliability and characteristic uniformity of transceiver have been improved by the use of the ICs in the second IF amplifier and Limiter, squelch noise amplifier, AF amplifier and output, and second local oscillator and buffer in the receiving unit, and the crystal oscillator and buffer, and microphone amplifier in the transmitting unit.

## E) OTL AUDIO OUTPUT CIRCUIT, AND FRONT SPEAKER SYSTEM

The use of an OTL system power IC with a maximum output of 5 watts (At 14.5 VDC) offering an extra

margin in the AF amplifier and output circuit ensures distortion-free tone quality. The built-in speaker arranged in the front panel, though small in size, offers satisfactory intelligibility. Connection of an external speaker (4Ω) will produce high-quality tone.

## F) 3-STEP SYSTEM TRANSMITTING OUTPUT

This transceiver operates with very high efficiency, delivering 10-Watt output on 12.0 Volts.

The power output is switchable by the output change-over switch in three steps; L : 0.1 W, M : 1.0 W, H : 10 W. During local QSO or group travel in vehicles, the output can be lowered for less disturbance to other stations and more effective use of radio frequencies to enrich your HAM life.

## G) UNITIZATION OF EACH UNIT

The chassis section, transmitter printed circuit board section, transmitter booster section and receiver printed circuit board section have been completely unitized for the characteristic uniformity of transceiver, resulting in easier maintenance and inspection.

## H) SEL-CALL UNIT CONNECTOR

A connector wiring for SEL-CALL unit is located in the rear panel of the set. Connection of SEL-CALL unit to this connector brings about more effective utilization of radio frequencies.

## 2. NAME OF COMPONENTS AND THEIR FUNCTIONS (1)

### ◆ POWER SWITCH (PWR)

On the OFF position, the power supply is turned off. In the L, M and H positions, the power supply is turned on and the set starts operation.

The power output is 0.1W in the L position, 1W in the M position, and 10W in the H position.

### ◆ SQUELCH

Turn the SQUELCH knob clockwise to the center position, and the squelch circuit will start operation. With the squelch circuit in operation, the AF circuit will operate, producing sound only when there is incoming signal.

### ◆ VOLUME

Counterclockwise turning of VOLUME control knob reduces sound volume, while clockwise turning increases it.

### ◆ CHANNEL SWITCHING

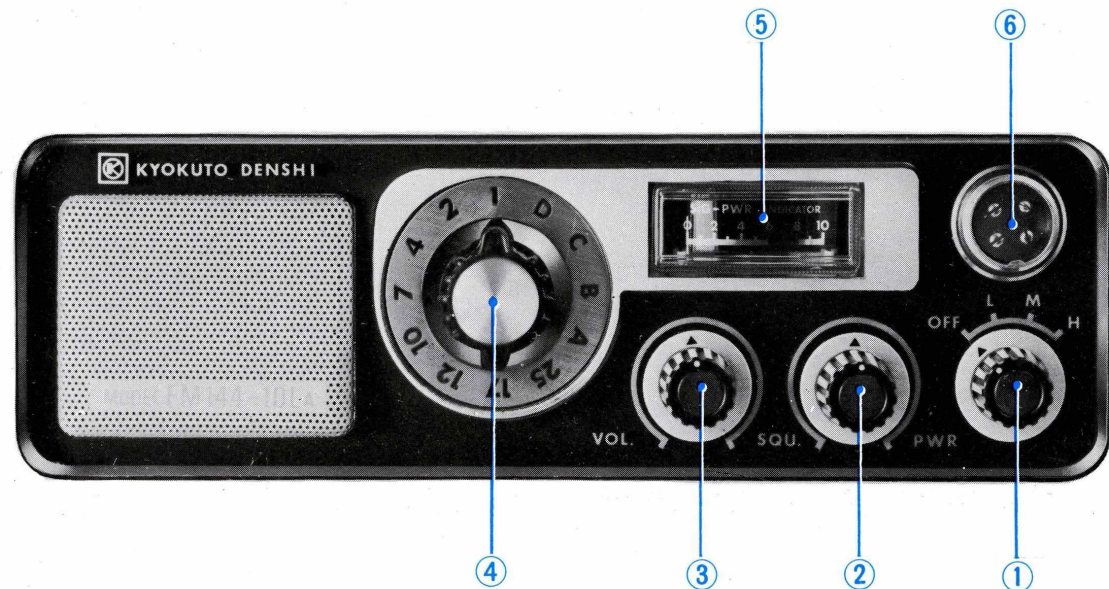
Refer to the frequency table for dial marking number and frequencies. A lamp located right above center illuminates the selected channel. Since the dial is of type, it can be turned either clockwise non-end-stop or counterclockwise.

### ◆ METER INDICATOR

Receiving the signal, an indication needle swings depending upon the signal strength. (Indicates approximately 20dB input, with a needle pointing at 8) During 10W transmission at the adjusted center frequency, the needle will indicate to the red mark or so. Changeover between transmission and receiving is operated automatically.

### ◆ MICROPHONE TERMINAL

Connect the Microphone plug into this terminal and press the press-to-talk switch for transmission.



## 2. NAME OF COMPONENTS AND THEIR FUNCTIONS (2)

### ⑦ ANTENNA TERMINAL

This is M-type terminal for antenna. The antenna with impedance of  $52\sim 75\Omega$  matches this transceiver, but when used as the mobile station, the use of  $52\Omega$  coaxial cable is recommended because antenna impedance is reduced in that case.

### ⑧ SPEAKER TERMINAL

Connect an external speaker to this terminal. Matching speaker impedance is  $4\Omega$ .

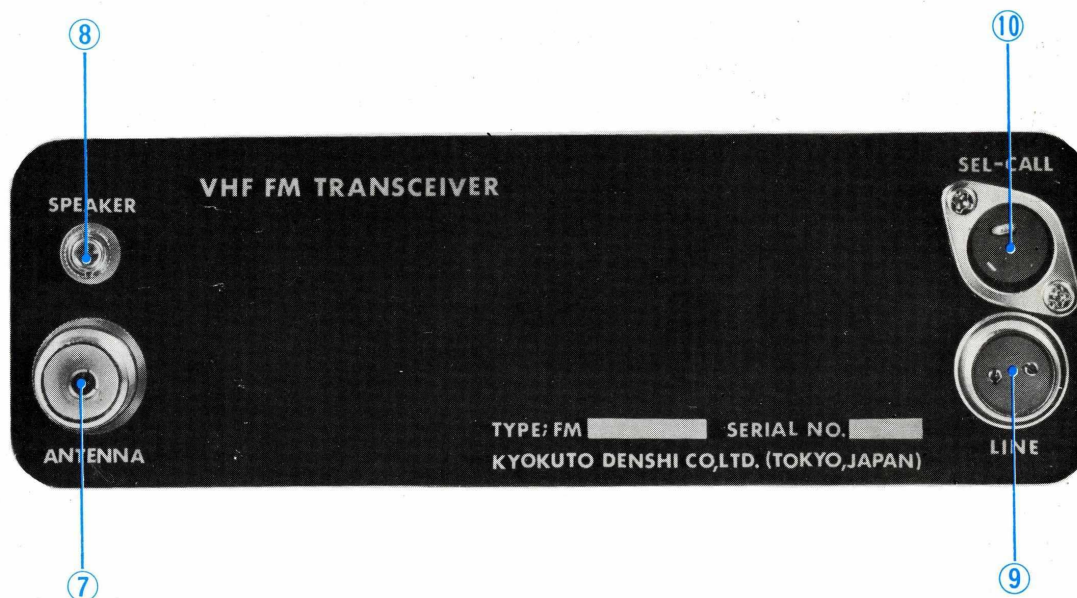
### ⑨ LINE TERMINAL

Connect it to the power cable. Supplied voltage is 12 to 14.5V. Red-coded is (+) and black-coded is (-). (case is (-) grounded)

### ⑩ SEL-CALL SYSTEM TERMINAL

Connect a SEL-CALL unit to this connector terminal for selective calling. When the SEL-CALL unit is not used, it is required to operate the transceiver, keeping the jumper in its place, because if the jumper is removed, no AF output will be connected to the speaker.

### REAR PANEL



## 3. INSTALLATION AND OPERATING PROCEDURES

### ● MOBILE STATION

- A) Secure the set mounting metal bracket to the car dashboard, and then install the set. This bracket is designed so that the set can be quickly and easily removed from the vehicle.
- B) Connect the coaxial cable to the ANTENNA connector terminal.
- C) Connect the power cable. Note that the red lead wire is for (+) and the black for (-). If the cable is extended over a long distance, use a thicker cable to prevent voltage drop.
- D) Connect the microphone.
- E) The power supply voltage is 12 to 14.5V DC.

### ● FIXED STATION

- A) An optimum power supply is 12V DC 3A regulated power supply. For operation at a higher voltage than 12V, use a power supply with sufficient margin in current capacity, because both the output and current correspondingly increase. (2.5A on 12V; approx. 3.5A on 14.5V)
- B) When an external speaker is used, use the attached speaker plug. Matching speaker impedance is 4Ω.

### ● OPERATING PROCEDURE

- A) Set the CHANNEL switch to a desired channel.
- B) Turn the SQUELCH control knob fully counterclockwise.
- C) Set the PWR switch to ON. The channel dial and meter illumination lamps will light.
- D) Turn the VOLUME control knob clockwise, and the internal noise of the receiver will be heard. If no noise is heard, it means that the polarity of the power supply is reversed. Confirm if the polarity is correct.
- E) If the noise is left audible, it will be annoying to the ear. Turn the SQUELCH control knob clockwise, and the noise will fade out in almost the center position. Set the control knob to this position, and the AF circuit will operate and produce sound only when there is incoming signal.
- F) For transmission, press the press-to-talk switch of the microphone.
- G) When the power output is 10W, the meter will indicate the red mark or its vicinity.

- H) For the better tone quality and clarity, connect a larger external speaker to the speaker terminal.

## 4. ADJUSTMENT PROCEDURES AND MISCELLANEOUS

### ● ADJUSTMENT PROCEDURE

- A) The final stage matching impedance of the transmitter unit is adjusted to an optimum point by a 50 $\Omega$  power meter. With the set connected to the antenna, adjust alternately the output matching trimmer of the booster section in the lower part of the set so that the meter will point to a maximum point. Inadequate matching will be a cause for reduced output or TVI. If the adjusted trimmers are about the same in position, it means that the antenna is matched to 50 $\Omega$ .
- B) The operating point of the SQUELCH control may be changed to an easier-to-use position by the semi-fixed variable resistor VR (R58) for fine adjustment of squelch control.
- C) The sensitivity of the receiving meter may be changed by the semi-fixed VR (R20) for meter sensitivity adjustment.
- D) The modulation degree for transmission may be changed by the modulation sensitivity control VR (R34).
- E) If the sound of the AC dynamo of your vehicle interferes with transmitting carrier, connect the large capacity coaxial cable directly from the battery to the set, and the noise will be effectively reduced.
- F) The pilot lamp is a 12V one for models, that is available in numerous hobby shops and is the same as used in miniature model railroad lamps.

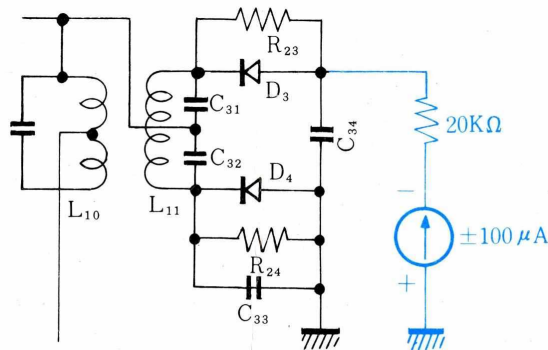
### ● OTHER APPLICATIONS

#### A) Remote control of channel selection

Remove the common lead wire circuit of the channel selector switches and take out the leads of the individual channel circuits. Application of +12V to the leads corresponding to the respective channel will operate the corresponding channels. Since the transmitter and receiver units are simultaneously switched over, only one lead is required for one channel. If the leads for all the channels are taken out, therefore, they will make up 13 wires in total.

#### B) Center meter circuit

Frequency difference between your station's receiving frequency and other station's transmitting frequency is shown by this meter to be installed in the detection circuit of receiving unit, as shown in the figure below. When (+) terminal is wired in the earth side, the indication needle swings to (+) in case of other station's transmitting frequency being higher than your receiving frequency, and to (-) in case of vice versa.



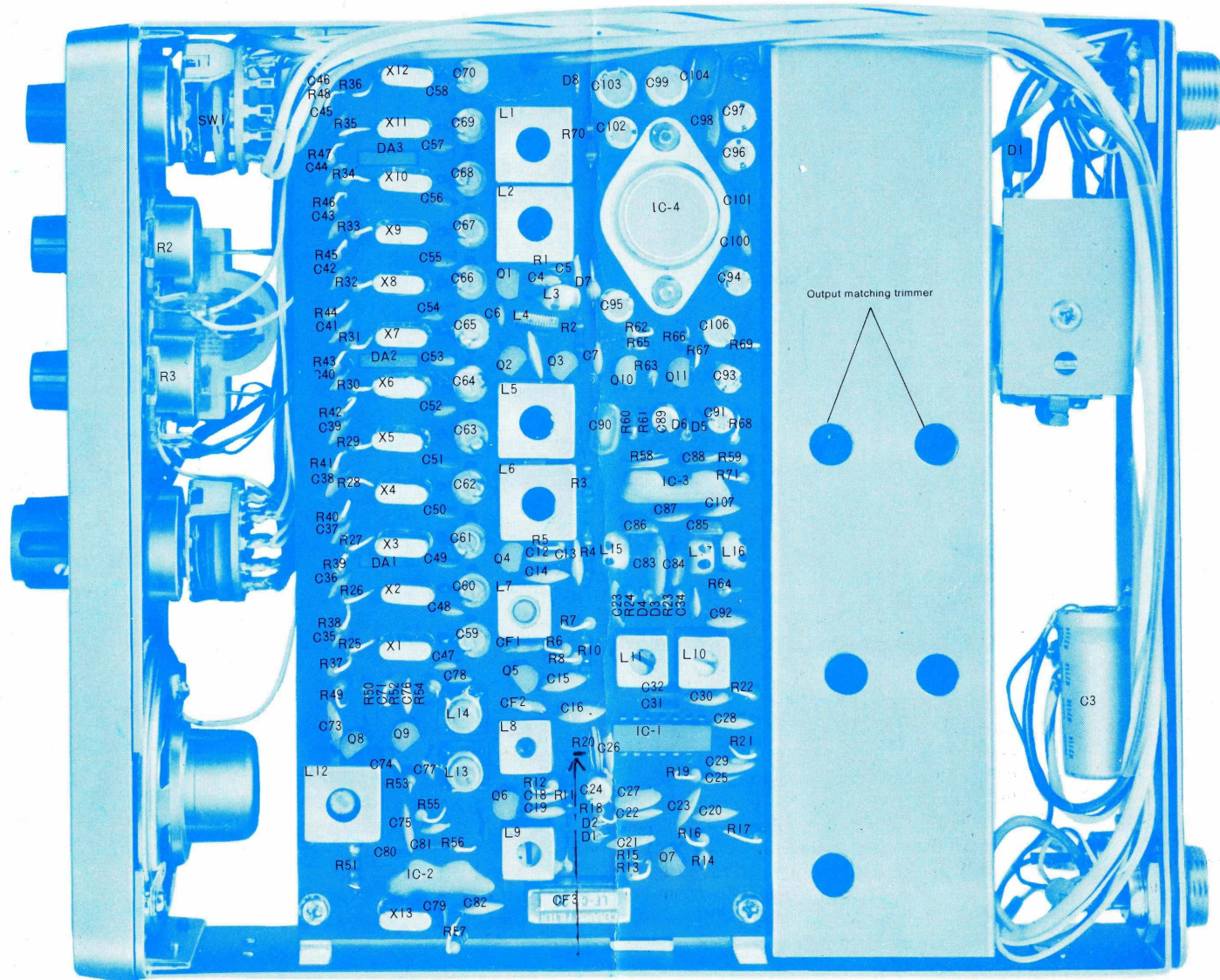
#### C) CERAMIC FILTER

The ceramic filter used in this set to determine the bandwidth of the second IF circuit is a 9-element filter ( $\pm 10\text{KHz}$  at  $-6\text{dB}$ ,  $\pm 19\text{KHz}$  at  $-50\text{dB}$ ). The printed-circuit board of receiving unit of this set is designed so as to allow the installation of a 15-element filter. To achieve higher performance band characteristics, therefore, the filter may be replaced with a 15-element filter ( $9 \pm 10\text{KHz}$  at  $6\text{dB}$ ,  $\pm 18\text{KHz}$  at  $-70\text{dB}$ ).

#### D) SEL-CALL

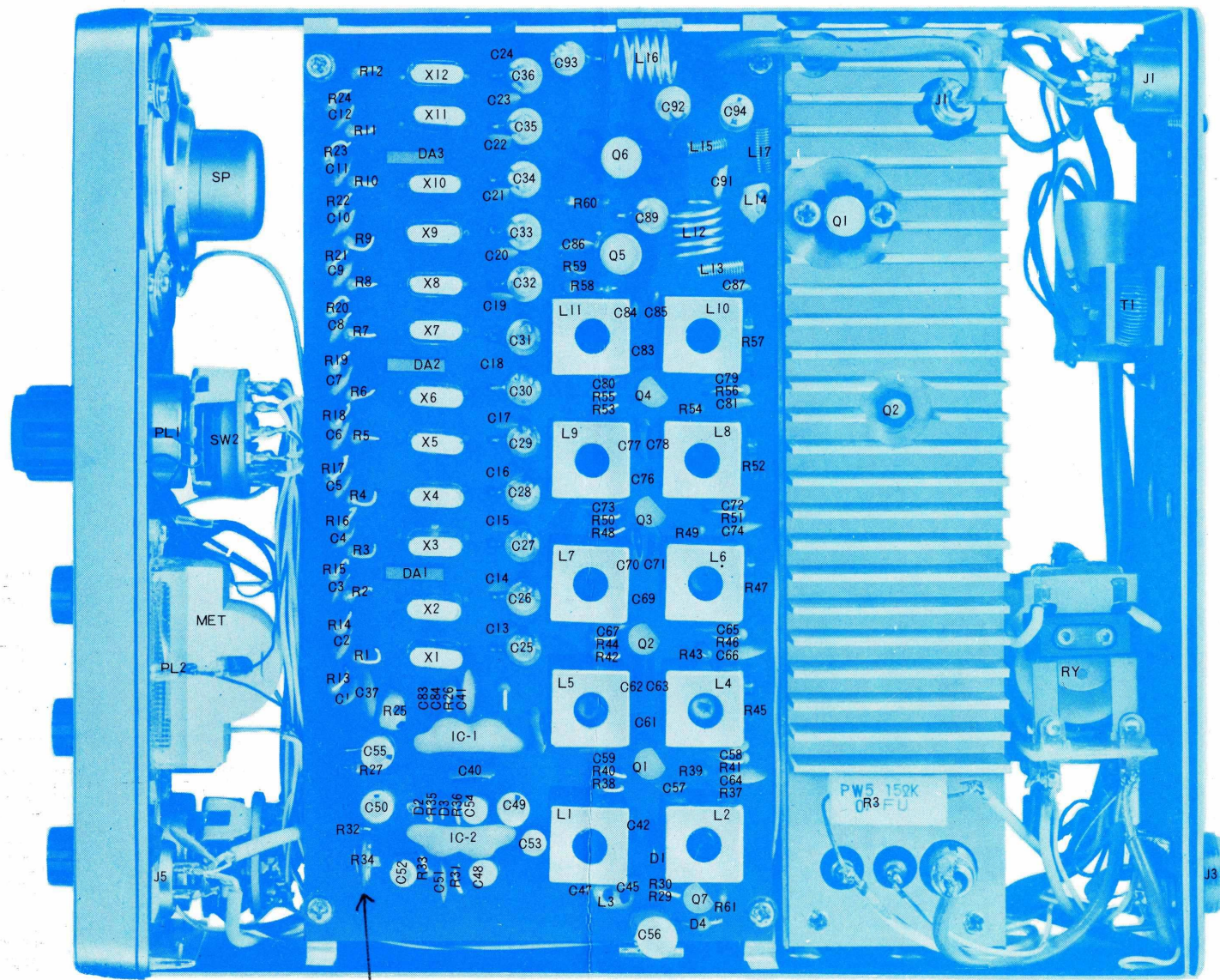
The rear panel of the set is provided with a terminal for an external SEL-CALL unit. Connection of the SEL-CALL unit makes selective calling possible. Even in highly congested radio frequency areas, the selective calling will enable you to quietly reach any desired station, thus securing more effective use of radio frequency.

## 5. LAYOUT OF COMPONENTS OF RECEIVING UNIT (Bottom View)



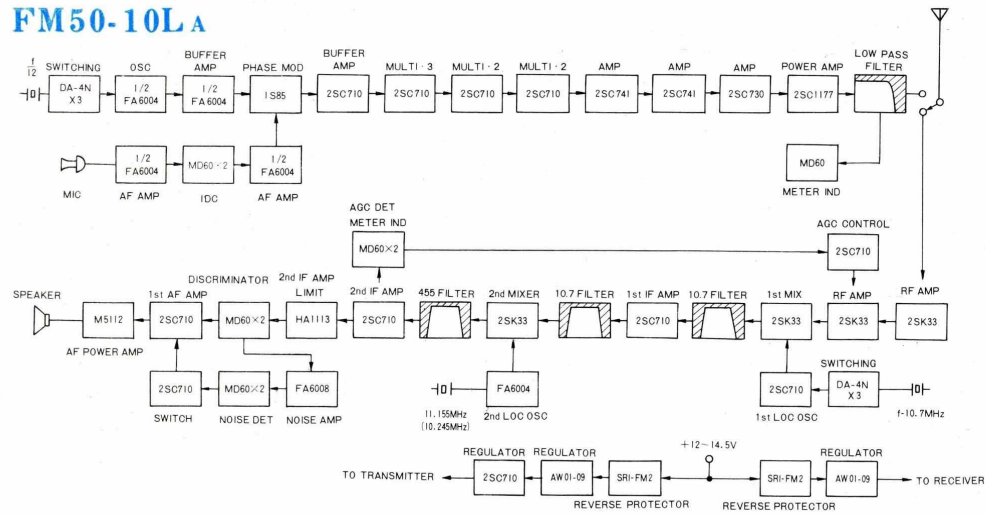


## 6. LAYOUT OF COMPONENTS OF TRANSMITTING UNIT (Top View)

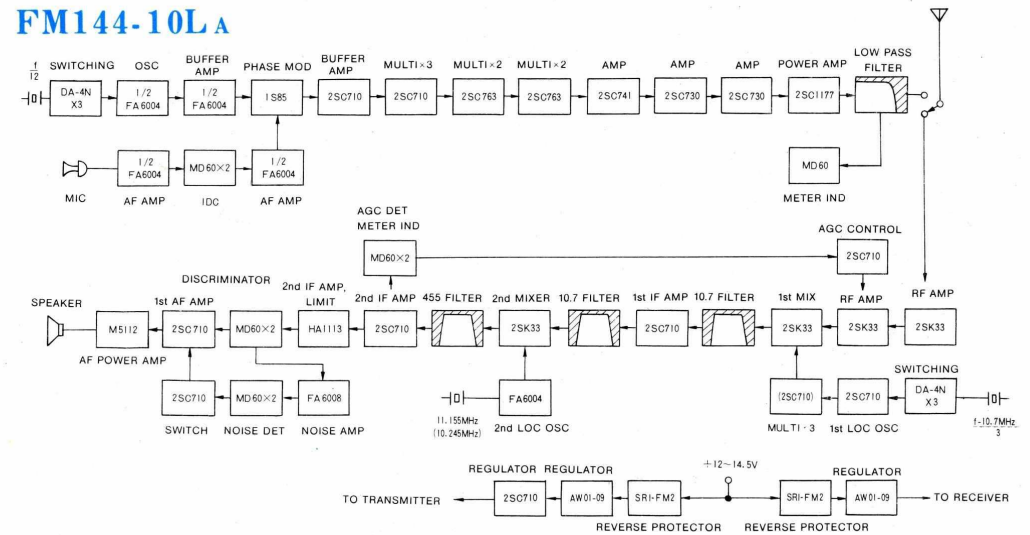


# 7. BLOCK DIAGRAM

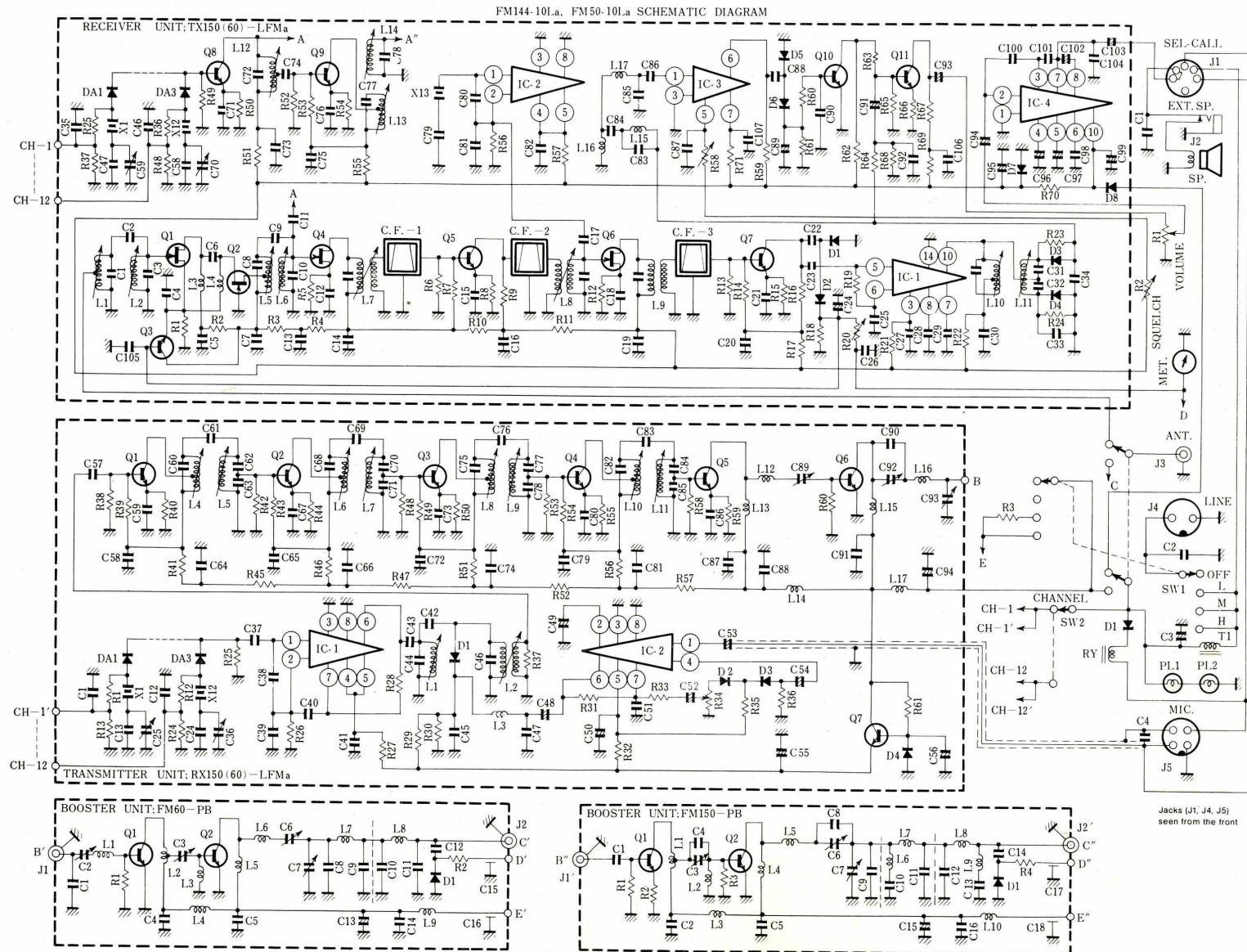
## FM50-10LA



## FM144-10LA



# 8. SCHEMATIC DIAGRAM



# 9. COMPONENT LIST OF TRANSMITTING UNIT

REF SYMBOL	<del>TX150-LFMa</del> DESCRIPTION	<del>TX60-LFMa</del> DESCRIPTION	REF SYMBOL	TX150-LFMa DESCRIPTION	<del>TX60-LFMa</del> DESCRIPTION	REF SYMBOL	TX150-LFMa DESCRIPTION	<del>TX60-LFMa</del> DESCRIPTION	REF SYMBOL	<del>FM150-PB</del> DESCRIPTION	<del>FM60-PB</del> DESCRIPTION
K-1			C-39	300PF	300PF	Q-1	2SC710	2SC710	C-1	20PF	100PF
⋮			C-40	50PF	50PF	Q-2	2SC710	2SC710	C-2	TLB-11	.04μF
R-24	2.7KΩ	2.7KΩ	C-41	.02μF	.02μF	Q-3	2SC763	2SC710	C-3	CV01C-450Z	CV01C-450Z
R-25	1mH	2.7KΩ	C-42	5PF	5PF	Q-4	2SC763	2SC710	C-4	.001μF	100PF
R-26	1KΩ	1KΩ	C-43	50PF	50PF	Q-5	2SC741	2SC741	C-5	.001μF	.04μF
R-27	100Ω	100Ω	C-44	100PF	150PF	Q-6	2SC730	2SC741	C-6	CV11D450	CV11D450
R-28	470KΩ	470KΩ	C-45	.001μF	.001μF	Q-7	2SC710	2SC710	C-7	CV11D450	CV11D450
R-29	22KΩ	22KΩ	C-46	100PF	150PF	IC-1	FA6004	FA6004	C-8	15PF	50PF
R-30	2.7KΩ	2.7KΩ	C-47	.02μF	.02μF	IC-2	FA6004	FA6004	C-9	15PF	100PF
R-31	470KΩ	470KΩ	C-48	2μF	2μF	D-1	1S85	1S85	C-10	15PF	30PF
R-32	220Ω	220Ω	C-49	10μF	10μF	D-2	MD60	MD60	C-11	15PF	50PF
R-33	10KΩ	10KΩ	C-50	10μF	10μF	D-3	MD60	MD60	C-12	2PF	50PF
R-34	10KΩ (V.R.)	10KΩ (V.R.)	C-51	.02μF	.02μF	D-4	AW01-09	AW01-09	C-13	10μF	30PF
R-35	470KΩ	470KΩ	C-52	2μF	2μF	DA-1	DA-N4	DA-N4	C-14	.001μF	2PF
R-36	10KΩ	10KΩ	C-53	2μF	2μF	DA-2	DA-N4	DA-N4	C-15	1000PF	10μF
R-37	47Ω	47Ω	C-54	2μF	2μF	DA-3	DA-N4	DA-N4	C-16	1000PF	.001μF
R-38	2.7KΩ	2.7KΩ	C-55	10μF	10μF	L-1	L003	L001	C-17	-----	1000PF
R-39	22KΩ	22KΩ	C-56	47μF	47μF	L-2	L006	L001	C-18	-----	1000PF
R-40	100Ω	100Ω	C-57	.001μF	.001μF	L-3	1mH	1mH	Q-1	2SC730	2SC730
R-41	100Ω	100Ω	C-58	.02μF	.02μF	L-4	L003	L001	Q-2	2SC1177	2SC1177
R-42	2.7KΩ	2.7KΩ	C-59	.02μF	.02μF	L-5	L003	L001	D-1	MD60	MD60
R-43	22KΩ	22KΩ	C-60	150PF	200PF	L-6	L005	L002			
R-44	100Ω	100Ω	C-61	2PF	200PF	L-7	L005	L002			
R-45	10Ω	10Ω	C-62	200PF	200PF	L-8	L009	L003			
R-46	100Ω	100Ω	C-63	400PF	400PF	L-9	L009	L003			
R-47	10Ω	10Ω	C-64	⋮	⋮	L-10	L008	L005			
R-48	2.7KΩ	2.7KΩ	⋮	.02μF	.02μF	L-11	L008	L005			
R-49	22KΩ	22KΩ	C-67	⋮	⋮	L-12	L011	L013			
R-50	100Ω	100Ω	C-68	40PF	40PF	L-13	L012	8.2μH			
R-51	100Ω	100Ω	C-69	2PF	2PF	L-14	8.2μH	20μH			
R-52	10Ω	10Ω	C-70	50PF	50PF	L-15	L012	8.2μH			
R-53	2.7KΩ	2.7KΩ	C-71	200PF	100PF	L-16	L011	L013			
R-54	22KΩ	22KΩ	C-72	.02μF	.02μF	L-17	L012	20μH			
R-55	100Ω	100Ω	C-73	.02μF	.02μF	X-1	-----	(T) 51.00			
R-56	100Ω	100Ω	C-74	.02μF	.02μF	X-2	(T) 144.40	-----			
R-57	10Ω	10Ω	C-75	40PF	20PF	X-3	-----	-----			
R-58	100Ω	100Ω	C-76	2PF	2PF	X-4	(T) 144.48	(T) 51.12			
R-59	1Ω	10Ω	C-77	50PF	30PF	X-5	-----	-----			
R-60	100Ω	100Ω	C-78	100PF	50PF	X-6	-----	(T) 51.20			
R-61	470Ω	470Ω	C-79	.001μF	.02μF	X-7	(T) 144.60	-----			
C-1	.001μF	.001μF	C-80	.001μF	.02μF	X-8	-----	-----			
⋮			C-81	.001μF	.02μF	X-9	-----	-----			
C-12			C-82	10PF	20PF	X-10	-----	-----			
C-13			C-83	2PF	2PF	X-11	-----	(T) 51.40			
⋮			C-84	10PF	20PF	X-12	(T) 144.80	-----			
C-24	20PF	20PF	C-85	30PF	30PF	REF SYMBOL	FM150-PB DESCRIPTION	FM60-PB DESCRIPTION			
⋮			C-86	.001μF	.02μF	R-1	47Ω	10Ω			
C-25			C-87	.001μF	.02μF	R-2	180KΩ	5Ω			
⋮			C-88	.001μF	.02μF	R-3	-----	47Ω			
C-36	30PF (V.C.)	30PF (V.C.)	C-89	30PF (V.C.)	30PF (V.C.)	R-4	-----	180KΩ			
⋮			C-90	-----	20PF						
C-37	.02μF	.02μF	C-91	.001μF	.02μF						
C-38	400PF	400PF	C-92	30PF (V.C.)	30PF (V.C.)						
			C-93	30PF (V.C.)	30PF (V.C.)						
			C-94	10μF	10μF						

# 10. COMPONENT LIST OF RECEIVING UNIT

REF SYMBOL	RX150-LFMa DESCRIPTION	RX60-LFMa DESCRIPTION	REF SYMBOL	RX150-LFMa DESCRIPTION	RX60-LFMa DESCRIPTION	REF SYMBOL	RX150-LFMa DESCRIPTION	RX60-LFMa DESCRIPTION	REF SYMBOL	RX150-LFMa DESCRIPTION	RX60-LFMa DESCRIPTION
R-1	24Ω	24Ω	R-71	100Ω	100Ω	C-74	7PF	-----	D-1	MD60	MD60
R-2	10Ω	10Ω	C-1	10PF	20PF	C-75	.001μF	-----	D-2	MD60	MD60
R-3	10Ω	10Ω	C-2	1PF	2PF	C-76	.001μF	-----	D-3	MD60	MD60
R-4	10Ω	10Ω	C-3	7PF	15PF	C-77	10PF	-----	D-4	MD60	MD60
R-5	2.7KΩ	2.7KΩ	C-4	.001μF	.02μF	C-78	10PF	-----	D-5	MD60	MD60
R-6	4.7KΩ	4.7KΩ	C-5	.001μF	.02μF	C-79	40PF	40PF	D-6	MD60	MD60
R-7	10KΩ	10KΩ	C-6	.001μF	.02μF	C-80	400PF	400PF	D-7	AW01-09	AW01-09
R-8	1KΩ	1KΩ	C-7	.001μF	.02μF	C-81	300PF	300PF	D-8	SR1FM2	SR1FM2
R-9	1KΩ	1KΩ	C-8	10PF	20PF	C-82	.02μF	.02μF	DA-1	DA-N4	DA-N4
R-10	10Ω	10Ω	C-9	1PF	2PF	C-83	150PF	150PF	DA-2	DA-N4	DA-N4
R-11	10Ω	10Ω	C-10	7PF	20PF	C-84	.033μF	.033μF	DA-3	DA-N4	DA-N4
R-12	2.7KΩ	2.7KΩ	C-11	2PF	2PF	C-85	.033μF	.033μF	CF-1	10.7 MF-B	10.7 MF-B
R-13	2KΩ	2KΩ	C-12	.02μF	.02μF	C-86	.033μF	.033μF	CF-2	10.7 MF-B	10.7 MF-B
R-14	10KΩ	22KΩ	C-13	.02μF	.02μF	C-87	.033μF	.033μF	CF-3	I.FC-20	I.FC-20
R-15	100Ω	100Ω	C-14	.02μF	.02μF	C-88	.02μF	.02μF	L-1	I.007	I.004
R-16	1KΩ	1KΩ	C-15	.02μF	.02μF	C-89	2μF	2μF	L-2	I.008	I.005
R-17	100Ω	100Ω	C-16	.02μF	.02μF	C-90	.1μF	.1μF	L-3	8.2μH	8.2μH
R-18	4.7KΩ	4.7KΩ	C-17	5PF	5PF	C-91	2μF	2μF	L-4	I.012	8.2μH
R-19	4.7KΩ	4.7KΩ	C-18	.02μF	.02μF	C-92	.033μF	.033μF	L-5	I.008	I.005
R-20	30KΩ (V.R.)	30KΩ (V.R.)	C-19	.02μF	.02μF	C-93	2μF	2μF	L-6	I.008	I.005
R-21	100Ω	100Ω	C-20	.02μF	.02μF	C-94	2μF	2μF	L-7	KAC6400A	KAC6400A
R-22	100Ω	100Ω	C-21	.04μF	.04μF	C-95	10μF	10μF	L-8	KAC6400A	KAC6400A
R-23	47KΩ	47KΩ	C-22	.02μF	.02μF	C-96	10μF	10μF	L-9	YMC6038A	YMC6038A
R-24	47KΩ	47KΩ	C-23	.02μF	.02μF	C-97	10μF	10μF	L-10	YMC1500A	YMC1500A
R-25	∴	∴	C-24	2μF	2μF	C-98	.02μF	.02μF	L-11	YMC6038A	YMC6038A
∴	10KΩ	10KΩ	C-25	.02μF	.02μF	C-99	47μF	47μF	L-12	I.005	I.005
∴	∴	∴	C-26	.02μF	.02μF	C-100	.001μF	.001μF	L-13	I.008	-----
R-48	∴	∴	C-27	.02μF	.02μF	C-101	30PF	30PF	L-14	I.008	-----
R-49	4.7KΩ	4.7KΩ	C-28	.02μF	.02μF	C-102	10μF	10μF	L-15	1mH	1mH
R-50	470Ω	470Ω	C-29	.02μF	.02μF	C-103	47μF	47μF	L-16	1mH	1mH
R-51	100Ω	100Ω	C-30	.02μF	.02μF	C-104	.1μF	.1μF	L-17	1mH	1mH
R-52	2.7KΩ	-----	C-31	.02μF	.02μF	C-105	.02μF	.02μF	X-1	-----	(R) 51.00
R-53	22KΩ	-----	C-32	300PF	300PF	C-106	10μF	10μF	X-2	(R) 144.40	-----
R-54	470Ω	-----	C-33	300PF	300PF	C-107	.02μF	.02μF	X-3	-----	-----
R-55	100Ω	-----	C-34	50PF	50PF	Q-1	2SK33	2SK33	X-4	(R) 144.48	(R) 51.12
R-56	1KΩ	1KΩ	∴	∴	∴	Q-2	2SK33	2SK33	X-5	-----	-----
R-57	100Ω	100Ω	∴	.001μF	.001μF	Q-3	2SC710	2SC710	X-6	-----	(R) 51.20
R-58	10KΩ (V.R.)	10KΩ (V.R.)	C-46	∴	∴	Q-4	2SK33	2SK33	X-7	(R) 144.60	-----
R-59	4.7KΩ	4.7KΩ	C-47	∴	∴	Q-5	2SC710	2SC710	X-8	-----	-----
R-60	2.7KΩ	2.7KΩ	∴	20PF	20PF	Q-6	2SK33	2SK33	X-9	-----	-----
R-61	27KΩ	27KΩ	∴	∴	∴	Q-7	2SC710	2SC710	X-10	-----	-----
R-62	2.7KΩ	2.7KΩ	C-58	∴	∴	Q-8	2SC710	2SC710	X-11	-----	-----
R-63	100KΩ	100KΩ	C-59	∴	∴	Q-9	2SC710	2SC710	X-12	(R) 144.80	(R) 51.40
R-64	10KΩ	10KΩ	∴	30PF (V.C.)	30PF (V.C.)	Q-10	2SC710	2SC710	X-13	11.155MHz	11.155MHz
R-65	27KΩ	27KΩ	∴	∴	∴	Q-11	2SC710	2SC710	IC-1	HA1113	HA1113
R-66	220Ω	220Ω	C-70	∴	∴	IC-2	FA6004	FA6004	IC-2	FA6004	FA6004
R-67	1KΩ	1KΩ	C-71	100PF	100PF	IC-3	FA6008	FA6008	IC-3	FA6008	FA6008
R-68	4.7KΩ	4.7KΩ	C-72	20PF	20PF	IC-4	M5112	M5112	IC-4	M5112	M5112
R-69	1KΩ	1KΩ	C-73	.02μF	.02μF						
R-70	47Ω	47Ω									

# 11. VOLTAGE TABLES OF TRANSMITTING AND RECEIVING UNITS

## ● PRINTED-CIRCUIT BOARD OF RECEIVING UNIT

SEMICONDUCTOR	LEAD	VOLTAGE	SEMICONDUCTOR	LEAD	VOLTAGE
Q 1	G	0	Q 10	B	0~0.7
	D	8.5		C	8.9~0.1
	S	0.25		E	0
Q 2	G	0	Q 11	B	1.26~0.05
	D	8.5		C	3.5~9.0
	S	0.25		E	0.6~0
Q 3	B	0	IC-1	3	7.5
	C	8.5		5	2.1
	E	0.25		6	2.2
Q 4	G	0		7	2.1
	D	8.5		8	2.2
	S	1.35		10	8.8
Q 5	B	2.6	14	0	
	C	6.7	IC-2	1	2.0
	E	2.0		2	2.0
Q 6	G	0		3	0
	D	9.0		4	9.0
	S	1.8	5	9.0	
Q 7	B	1.3	8	0	
	C	2.7	IC-3	1	0.75
	E	0.7		3	0
Q 8	B	3.6		5	2.3
	C	8.2		6	9.0
	E	3.0	7	8.8	
Q 9	B	0.6	NOTE: * FM50-10L in parentheses * Measured with VTVM * Voltage: To earth * Measured value at no signal * ~: SQUELCH in operation		
	C	8.0			
	E	0.85			

## ● PRINTED-CIRCUIT BOARD OF TRANSMITTING UNIT

SEMICONDUCTOR	LEAD	VOLTAGE
Q 1	C	10
	E	0.4
Q 2	C	9.0
	E	1.6(0.8)
Q 3	C	10.5
	E	1.2
Q 4	C	10
	E	1.8
Q 5	C	12.0
	E	0.06 (0.7)
Q 6	C	12.0
	E	0
Q 7	B	9.0
	C	10.7
	E	8.4
IC-1	1	2.0
	2	1.5
	3	0
	4	7.8
	5	7.8
	6	1.5
	7	0.65
	8	0
IC-2	1	2.3
	2	1.8
	3	0
	4	4.5
	5	7.7
	6	3.1
	7	0.65
	8	0

## 12 SPECIFICATIONS

### 144MHz FM TRANSCEIVER TYPE FM144-10LA (12CHANNEL)

#### GENERAL

- \* FREQUENCY RANGE : 144.00 to 148 MHz (BAND WIDTH  $\pm 500$ KHz)
- \* CHANNEL : 12 Channels
- \* TYPE OF EMISSION : F3
- \* ANTENNA IMPEDANCE : 52 to 75 $\Omega$
- \* COMMUNICATION SYSTEM : One-way, Press-to-talk
- \* AMBIENT TEMPERATURE :  $-10^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$
- \* POWER SUPPLY VOLTAGE : 12.0 to 14.5V DC, (-) Grounded
- \* CURRENT CONSUMPTION : Transmitting L: 0.3A, M: 1A, H: 2.5A (at 12.0V)  
Receiving 0.15A standby, 0.6A maximum
- \* DIMENSIONS : 60mm H $\times$ 185mm W $\times$ 210mm D (2.4" H $\times$ 7.4" W $\times$ 8.4" D)
- \* WEIGHT : Appox. 1.7Kg (3.75 lbs) (main body)

#### TRANSMITTING UNIT

- \* OSCILLATOR CIRCUIT : Crystal-controlled
- \* FREQUENCY STABILITY : 0.002% or less
- \* MULTIPLICATIONS : 12 ( $3 \times 2 \times 2$ )
- \* MODULATION SYSTEM : Variable reactance phase modulation
- \* FREQUENCY DEVIATION :  $\pm 15$ KHz maximum
- \* AUDIO DISTORTION : Less than 10% at 1KHz, 70% modulation
- \* SPURIOUS RADIATION :  $-60$ dB or less below carrier

#### RECEIVING UNIT

- \* RECEIVING SYSTEM : Double superheterodyne
- \* INTERMEDIATE FREQUENCY : 1st 10.7MHz, 2nd 455KHz
- \* CRYSTAL FREQUENCIES : 1st  $\frac{f-10.7}{3}$  MHz, 2nd 11.155MHz (or 10.245MHz)
- \* FREQUENCY STABILITY : 0.005% or less
- \* RECEIVING SENSITIVITY : 0.5 $\mu$ V at 20dB quieting
- \* SQUELCH SENSITIVITY : Less than 0.3 $\mu$ V
- \* BANDWIDTH :  $\pm 10$ KHz at  $-6$ dB,  $\pm 19$ KHz at  $-50$ dB
- \* SELECTIVITY : 60dB or more (25KHz detuned)
- \* AUDIO OUTPUT : 5 Watts maximum (4 $\Omega$  at 14.5V), 3 Watts (4 $\Omega$  at 12V)

#### ACCESSORIES

- \* MICROPHONE (dynamic 600 $\Omega$ )
- \* POWER CABLE WITH FUSE HOLDER
- \* EXTERNAL SPEAKER PLUG
- \* SPARE FUSE (5A)
- \* MOUNTING METAL BRACKET AND SCREWS
- \* INSTRUCTION MANUAL

### 50MHz FM TRANSCEIVER TYPE FM50-10LA (12CHANNEL)

#### GENERAL

- \* FREQUENCY RANGE : 50 to 54MHz (bandwidth  $\pm 500$ KHz)
- \* TYPE OF EMISSION : F3
- \* ANTENNA IMPEDANCE : 52 to 75 $\Omega$
- \* COMMUNICATION SYSTEM : One-way, press-to-talk
- \* AMBIENT TEMPERATURE :  $-10^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$
- \* POWER SUPPLY VOLTAGE : 12.0 to 14.5V DC, (-grounded)
- \* CURRENT CONSUMPTION : Transmitting L: 0.3A, M: 1A, H: 2.5A at 12V  
Receiving 0.15A standby, 0.6A maximum
- \* DIMENSIONS : 60mm H $\times$ 185mm W $\times$ 210mm D (2.4" H $\times$ 7.4" W $\times$ 8.4" D)
- \* WEIGHT : Appox. 1.7Kg (3.75 lbs) (main body)

#### TRANSMITTING UNIT

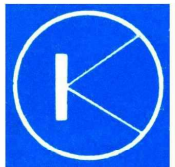
- \* OSCILLATOR CIRCUIT : Crystal-controlled
- \* FREQUENCY STABILITY : 0.002% or less
- \* MULTIPLICATIONS : 12 ( $3 \times 2 \times 2$ )
- \* MODULATION SYSTEM : Variable reactance phase modulation
- \* FREQUENCY DEVIATION :  $\pm 15$ KHz maximum
- \* AUDIO DISTORTION : Less than 10% at 1KHz
- \* SPURIOUS RADIATION :  $-60$ dB or less below carrier

#### RECEIVING UNIT

- \* RECEIVING SYSTEM : Double superheterodyne
- \* INTERMEDIATE FREQUENCY : 1st 10.7MHz, 2nd 455KHz
- \* CRYSTAL FREQUENCIES : 1st  $f-10.7$ MHz, 2nd 11.155MHz or 10.245MHz
- \* FREQUENCY STABILITY : 0.005% or less
- \* RECEIVING SENSITIVITY : 0.5 $\mu$ V at 20dB noise-suppressed
- \* SQUELCH SENSITIVITY : Less than 0.3 $\mu$ V
- \* BANDWIDTH :  $\pm 10$ KHz at  $-6$ dB,  $\pm 19$ KHz at  $-50$ dB
- \* SELECTIVITY : 60dB or more (25KHz detuned)
- \* AUDIO OUTPUT : 5 Watts maximum (4 $\Omega$  at 14.5V), 3 Watts (4 $\Omega$  at 12V)

#### ACCESSORIES

- \* MICROPHONE (dynamic 600 $\Omega$ )
- \* POWER CABLE WITH FUSE HOLDER
- \* EXTERNAL SPEAKER PLUG
- \* SPARE FUSE (5A)
- \* MOUNTING METAL BRACKET, AND SCREWS
- \* INSTRUCTION MANUAL



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