IC-245

2 METER FM
(SSB-CW)
Digital Synthesized
Transceiver

INSTRUCTION
MANUAL

TABLE OF CONTENTS

Congratulations on your purchase of the ICOM IC-245. The IC-245 is unique in its mobility, flexibility and compact size. Outstanding performance capabilities are produced by the proprietary ICOM C MOS LSI built into each IC-245. By itself, the IC-245 gives full command of the 144—148MHz 2 meter band. Add the sideband adapter and the IC-245 is a multimode 4MHz FM, USB, CW unit. Carefully reading this manual will help you get the most pleasure and effective use from your new transceiver.

SECTION I FEATURES

Multi-mode mobile transceiver

The IC-245 provides 144 – 148MHz FM coverage and with the sideband adapter covers the upper sideband and CW in the 144 – 148MHz frequency range. Thus the IC-245 and sideband adapter can be used for DX, local calls, and satellite work.

Refined appearance and convenient layout

The knobs are easy to handle, the readout is large and easy on the eyes due to digit brightness during the day and automatic dimming in darkness, and the meter is easy to read. Again, ICOM has produced a set that is as attractive as it is functional.

A unique C-MOS LSI

The ICOM chip makes the IC-245 a revolutionary transceiver. This multi-function chip incorporates years of ICOM digital and PLL technology development. Compact size, dual VFO performance and an accurate, stable, digitalized frequency readout are possible due to the chip. Pulses generated by turning the dial are counted, thus controlling an up/down counter that controls a programmable divider in the PLL to change frequencies. Crystal-controlled oscillator-accurate levels are produced. SSB tuning is 100Hz per vernier increment and FM is 5KHz per vernier.

Dual VFO's

Two separate VFO's can be used either independently or together for simplex operation, to achieve a desired frequency split of 995KHz or less in duplex operation.

Continuous tuning system

ICOM's new continuous tuning system features an LED display that follows the tuning knob movement and provides an extremely accurate readout. Frequencies are displayed in 4 LED digits representing MHz to KHz. 100Hz digits are represented by each vernier scale mark. Automatic recycling restarts tuning at the top of the band, i.e., 147.999 when the dial goes below 144.000. Recycling changes 147.999 to 144.000 as well. Quick tuning in 5KHz steps is available, while the SSB adapter for SSB and fine tuning in 100Hz steps is provided for trouble free QSO operation. A click-stop mechanism prevents knob rotation due to vibration in mobile use.

Excellent performance in operation

Nearby strong signal interference is overcome by a MOSFET RF amplifier circuit, a specially designed 1st mixer circuit and the helical cavities used in the IC-245. These same elements provide great selectivity for binary signals, and maintain a high, stable sensitivity. A system of cascaded filters gives exceptional FM performance, and SSB performance is insured by a monolithic crystal filter and a ceramic filter.

The transmitter uses a balanced mixer in a single conversion system, a band-pass filter and a high-performance low-pass filter. This system provides distortion-free signals with a minimum spurious radiation level.

SECTION II SPECIFICATIONS

General Specifications

Semiconductor complement	Transistors	47
	FET	8
	IC (includ. LSI)	24
	Diodes	61
Frequency range	144.0MHz – 148.0MHz	
Frequency stability	Within ±1.5KHz at temperature variation from -10°C to +60°C.	
Mode	FM (F3)	
	SSB (A3J USB), CW (A1) (with SSB adaptor)	

Antenna impedence	50 ohms unbalanced
Power source voltage	DC 13.8V ± 15%
Grounding polarity	Negative ground
Power consumption (with DC 13.8V supply)	
in reception	at minimum AF volume 0.6A at maximum AF volume 0.8A
in transmission	at SSB (PEP 10W) 2.8A at CW FM (10W output) 2.8A at FM (10W output) 1.4A
Outline dimensions (in m/m)	(H) 57 x (W) 155 x (D) 235 (protruding portions not included)
Weight	Approx. 2.7Kg

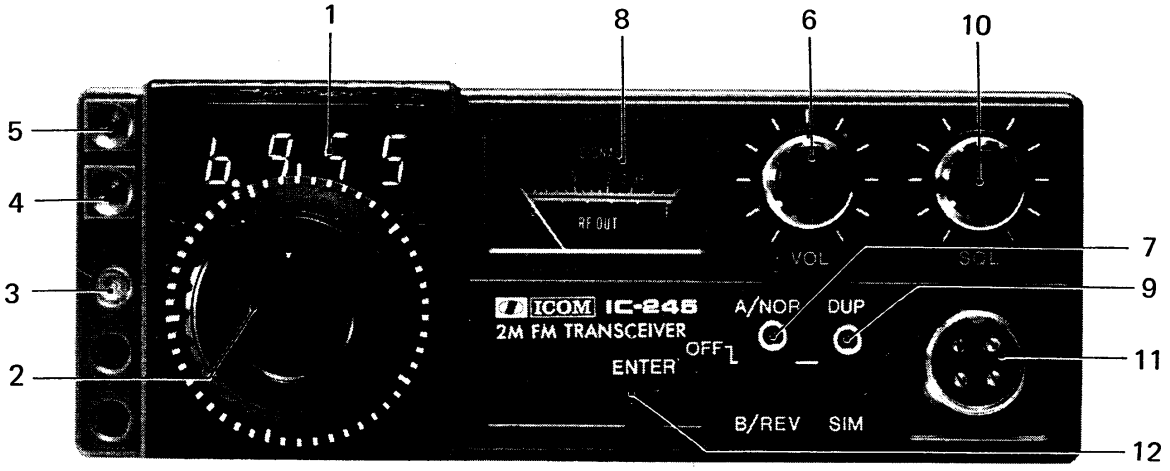
Transmitter unit

Frequency range	144.0MHz – 148.0MHz Continuously variable. Digital 2 VFO system included.
RF output power	SSB 10W (PEP) CW 10W FM 10W
Type of modulation	FM variable reactance frequency modulation
Maximum frequency deviation (FM)	±5KHz
Spurious level	Lower than -60dB
SSB carrier suppression ratio	More than 40dB
Microphone	600 ohms dynamic microphone with push-to-talk switch (IC-SM2 electric condenser microphone usable)

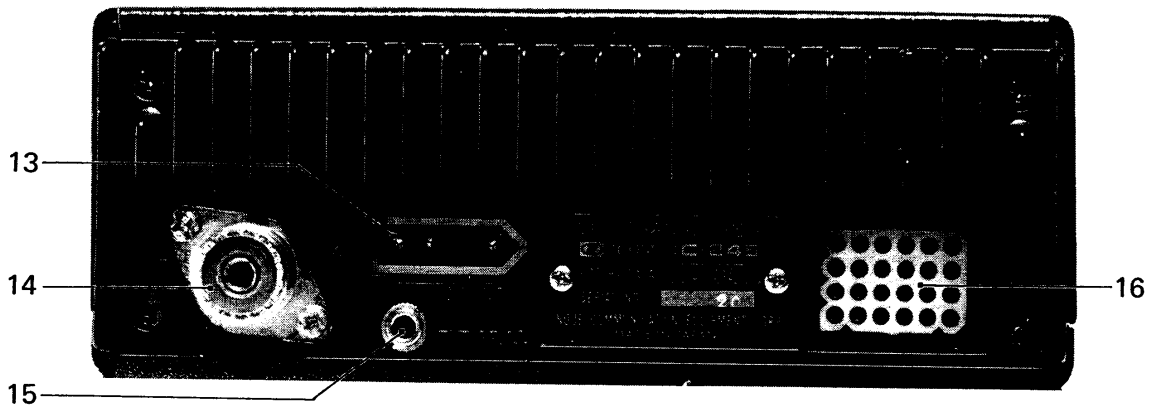
Receiver unit

Frequency Range	Same as transmitter
Receiving System	SSB, CW Single Super Heterodyne (SSB adaptor attached) FM Double Super Heterodyne
Intermediate Frequency	SSB, CW 10.7MHz FM 10.7MHz, 455KHz
Sensitivity	SSB, CW 0.5μV at (S+N)/N 10dB or better Noise Suppression Sensitivity 20dB 0.6μV or less
Squelch Sensitivity (FM)	0.4μV or less
Suprious Sensitivity	-60dB or better
Selectivity	SSB, CW ± 1.2KHz or better at -6dB ± 2.4KHz or better at -60dB FM ± 7.5KHz or better at -6dB ± 15KHz or better at -60dB
Audio Output	More than 1.5W (into 8Ω)
Audio Output Impedance	8 ohms

FRONT VIEW



BACK VIEW



SECTION III CONTROLS

Front Panel Configuration
The front panel controls are shown in Fig.

	CONTROL or CONNECTION	DESCRIPTION
1	Frequency Display	The operating frequency display of the set is shown by a 4-figure LED digital indicator with MHz to KHz digits. The frequency displayed is the carrier frequency of each communication mode (FM, SSB or CW), thus eliminating retuning when a mode is changed.
2	Tuning Knob	The tuning knob selects receiving and transmitting frequencies. Rotating, one vernier graduation shifts the frequency by 100Hz (5KHz by one complete rotation) in SSB and by 5 KHz steps (500KHz by one complete rotation) in FM. Push the TS switch (12) to change frequencies in 5KHz steps in SSB. For SSB operation frequencies are changed in 100KHz, and in FM, in 5KHz steps.
3	RECEIVE LED	Illuminated during reception. In FM operation, it is illuminated only when the squelch opens.
4	TRANSMIT LED	Illuminated during transmission.
5	Photo Sensor	A sensor used to detect the brightness of surroundings. When operating the set in the dark, the sensor actuates the dimmer circuit to furnish easier reading of meters and the frequency readout by reducing the light intensity level.
6	VOL (Volume Control) Knob	A knob used to control the audio-level of the received signals. Turning clockwise will increase the audio level. Set the volume to the proper audio level as desired.
7	VFO	A selector switch used to either "A/Norm" or "B/Rev" VFO. When set to "A", both reception and transmission will operate with "A" VFO and when set to "B", they will operate with B-VFO. When changing from A to B VFO, the frequency used before change over of the selector switch is memorized in A VFO. Even after changing frequency with B-VFO, the memorized A-VFO frequency is still usable by restoring the switch to "A" position. (From B to A, the same function is provided.)
8	Meter	When receiving, this meter will operate as an S-meter to indicate signal strength and when transmitting, the meter shows relative RF-power output.

9	Function Switch	A switch used to turn on and off the power source and to change from simplex to duplex operation.
10	SQL (Squelch) Knob	A knob used to adjust the squelch operation level in FM reception. When the set is adjusted to the noise shut-off point with no signal, a voice will be audible when signals are received.
11	MIC Connector	Use the microphone supplied with the set. An optional desk type ICOM microphone, IC-SM2, can also be used without modification. Other microphones of 500–600 ohms impedance can also be used.
12	Enter Switch	Used to enter or lock in a frequency, split for duplex operation.

The following is a detailed discription of the rear panel connections. Refer to Fig.

	CONTROL or CONNECTION	FUNCTION
13	DC Power Connector	When using a DC power supply of 13.8V, connect the supplied DC power cable to this connector.
14	ANT (Antenna) Connector	A connector for antennas having an impedance of 50 ohms. Use an M-type coaxial connector.
15	External Speaker Jack	External speakers of 8 ohms impedance when used, are connected to this jack. When external speakers are connected, the built-in speaker is made inoperative. inoperative.
16	ACC (Accessory)	Various adapters can be used through terminals in this jack for frequency control input, modulation output, receiver output, T/R change-over control and so on. The table below shows terminal connections of this connector. Care should be taken not to apply voltages other than -0.5V to +5V to terminals between No.15 and No. 24 as they are connected with the C-MOS IC. Optional connecting plugs are available.

Terminal No. Connection

1. Output from discriminator.
2. DC 13.8V in conjunction with power switch operation.
3. Connected to push-to-talk T.R. change-over switch. When grounded, set operates in transmission mode.
4. Output from receiver detector stage. Fixed output regardless of AF output or AF gain control level.
5. TX shutdown terminal. When grounded, no RF power is transmitted.
6. DC 9V available when transmitted. (relay can not be directly actuated).
7. Input for external ALC voltage.
8. Ground.
9. NC (no connection)
10. NC (no connection)
11. NC (no connection)
12. NC (no connection)
13. NC (no connection)
14. NC (no connection)
15. LOCK Input to lock dial externally.
16. UDC Input to control up-down externally.
17. SCAN Input to scan frequency.
18. CL Input to clear frequency.
19. FCL Input to clear counter in specified digit and input for MSB date.
20. K0 Input for frequency control data.
21. K1 Input for frequency control data.
22. K2 Input for frequency control data.
23. K3 Input for frequency control data.
24. K4 Input for frequency control data.

SECTION IV INSTALLATION

Install the IC-245 with the following precautions.

Avoid a place subject to direct sunshine, high temperature, high humidity, excessive vibration, dust and other adverse influences.

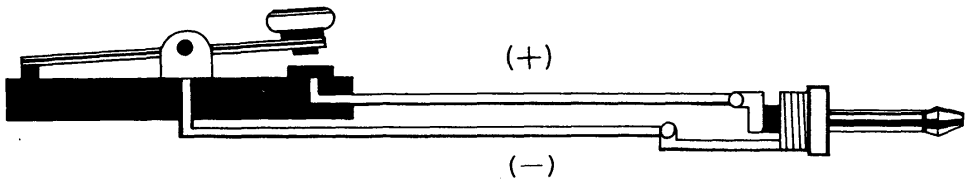
Select a place where operation of controls, knobs and switches is easy and the meter and the dial are clearly readable.

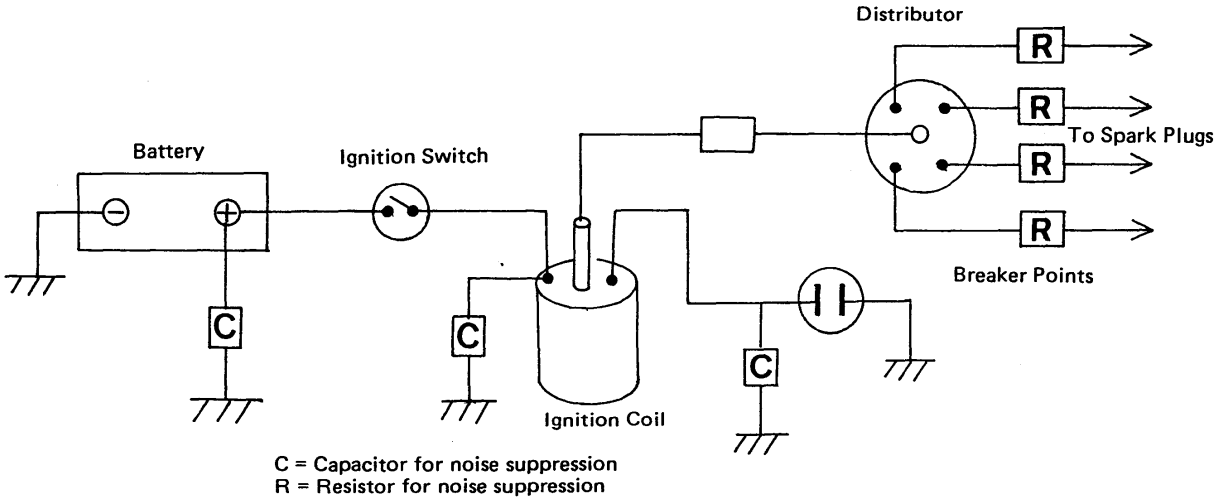
Use the special mounting bracket supplied with the set.
Choose a place for installation with enough structural strength to bear the weight of the set.
Avoid placing the set near a heater or an air conditioner exhaust.
Be sure there is adequate space for ventilation around the set in the car.

Install the set in an easy-to-see location for driving safety.

Mobile Mounting
Install the set using the mobile mounting fixture supplied.

Key Connection

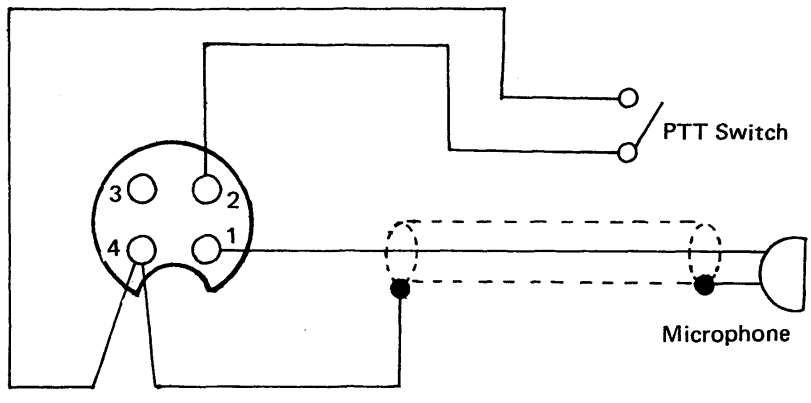




Ignition Noise

Care has been taken to suppress ignition noise within the set. However, in some kinds of auto-mobiles, excessive noise may occur. In that case, provide a filter circuit as shown in this figure. Remarkeble noise suppression is furnished by this arrangement.

Connection of Microphone



Installation

(1) Fasten the mobile mounting angle bracket on the lip of the dash with the mounting bolts supplied.

(2) Fasten the mobile mounting holder A to the angle bracket with the four ornamental screws.

(3) Install the set in the mobile mounting holder A.

(4) Hook up pawls of the mounting holder B into holes provided on the holder A.

(5) Clamp the set by tightening the holder B and lock the quick fastener by pulling down the knob.

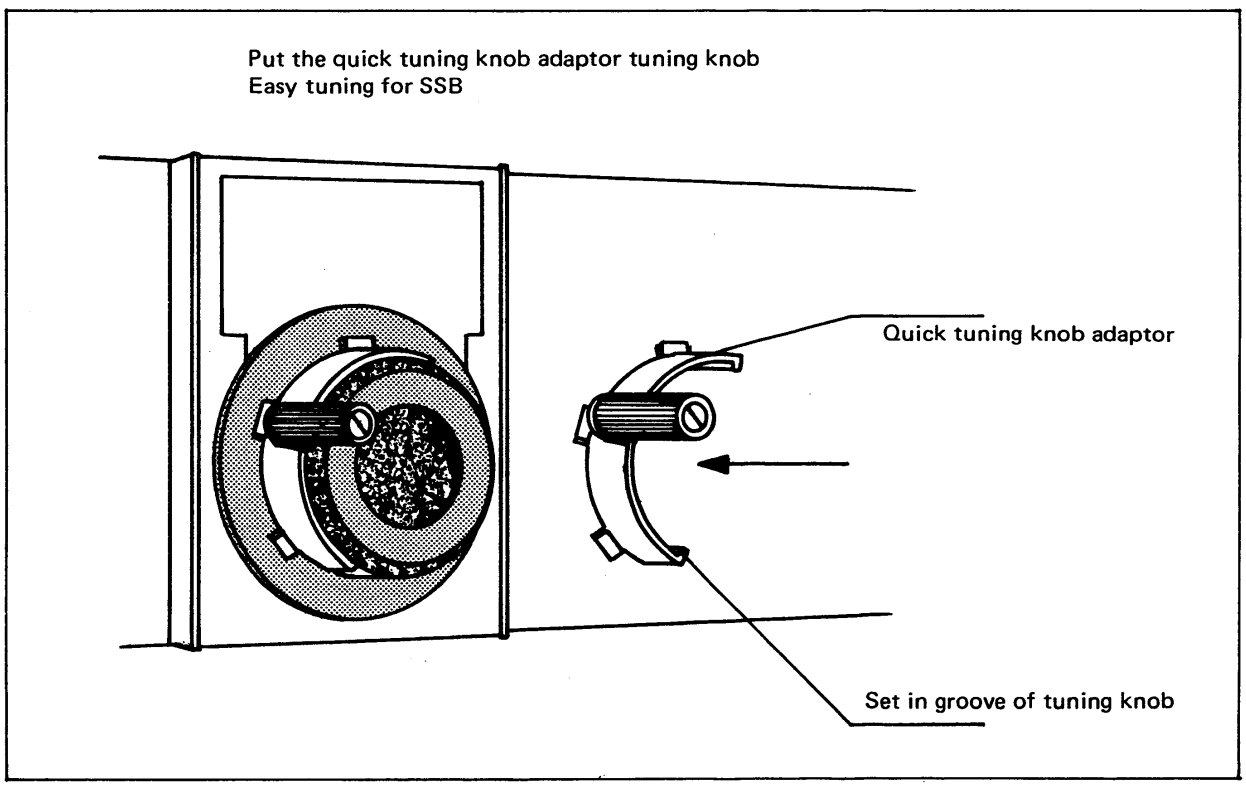
Removal

Unlock the quick fastener and loosen the holder B.

Adjustment of installation angle and position.

(1) With the quick fastener, the unlocked set can be moved back and forth to select a suitable position. (Note that if the set is pulled out too far, the built-in speaker will be partially covered by the mounting bracket.)

● Installation of quick tuning knob adaptor



(2) The installation angle can be adjusted over an 18° arc. Loosen screws at both sides and position the set at the most convenient angle for easy operation.

Fixed Station Use

When the set is used as a fixed station, use the supplied mobile mounting fixtures supplied with the IC-3PA power supply.

Power Supply for a Fixed Station

The rated power supply voltage of this set is 13.8V ± 15%. Use a stabilized voltage power source of 13.8V with current capacity of more than 3A for a fixed station set. Reliable ICOM power supplies are ideal for this station use.

External Speaker

When used as a fixed station, the face of the speaker is placed downward. Therefore, we recommend the use of an external speaker. Be sure to use a speaker of 8 ohms impedance. An external speaker is an integral part of regulated ICOM power supplies.

The set is designed for use with an antenna having a matched impedance of 50 ohms.

Transmission power loss in VHF antenna systems tends to be greater. Select a low-loss VHF antenna for best performance.

Install a high performance antenna in an elevated position. Make sure the antenna connection to the coaxial cable is fixed to withstand vibration and sealed against moisture.

Grounded antennas for automobiles, such as whip antennas, should be grounded positively to the chassis.

Do not connect a whip antenna directly to the antenna connector. Use a coaxial cable between the antenna and the antenna connector. Keep the antenna more than 1 meter away from the set.

External Speakers

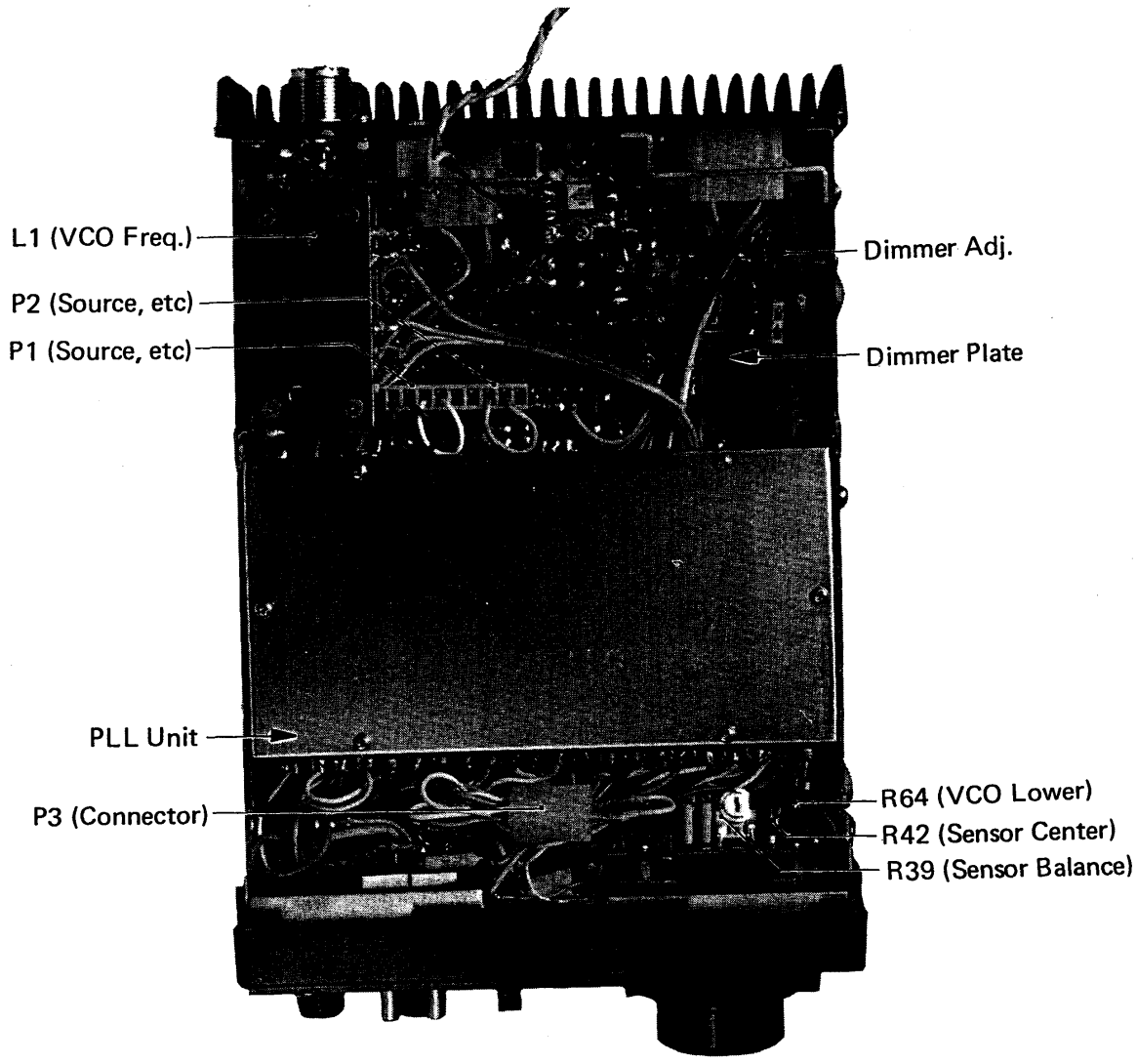
Although the IC-245 is provided with a built-in speaker, there is a jack located on the rear panel of the set for an external speaker of 8 ohms impedance. When the external speaker is used, the built-in speaker will not operate. Headphones of 8-16 ohms impedance can also be used.

DC Power Cable

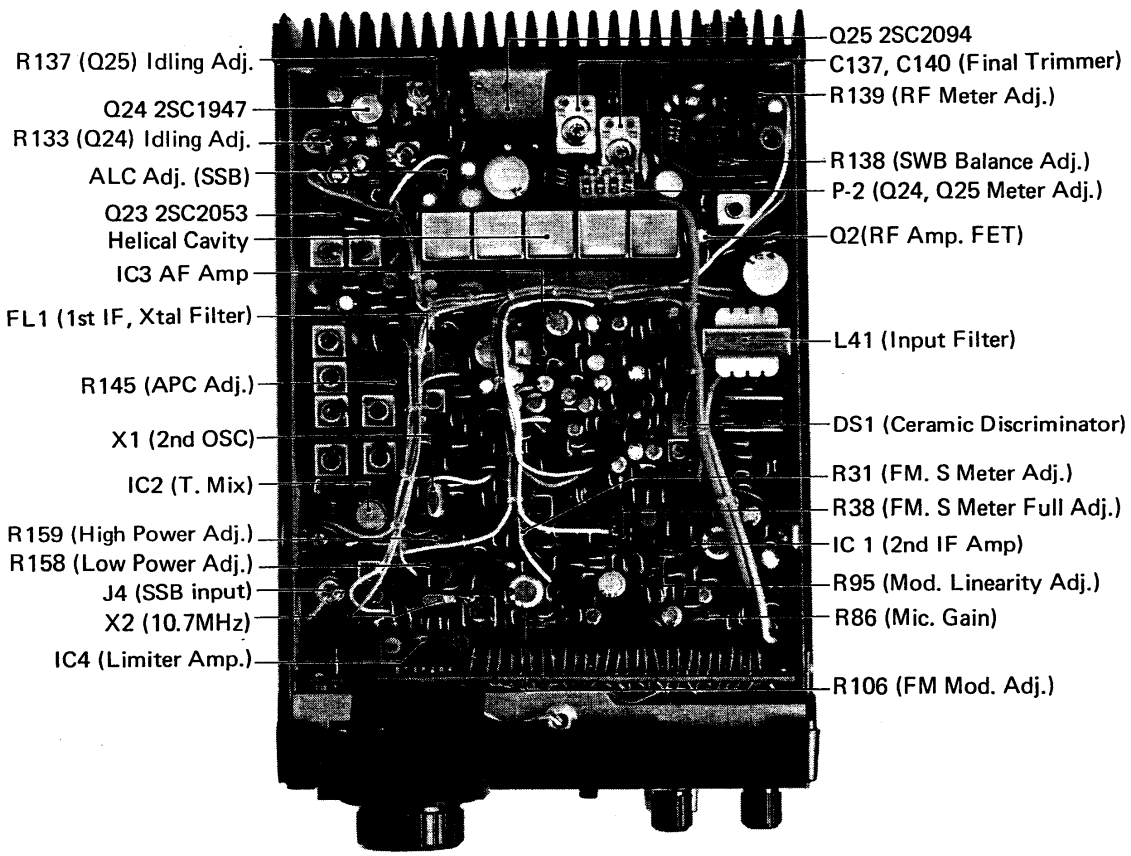
When using a DC power source such as a battery, connect the DC power cable to the battery before making the connection to the set. Connect the red cable to POSITIVE (+) and the black cable to the NEGATIVE (–) terminals of the battery after making certain of the polarity. Reversing polarity will blow out the fuse in the power cable due to actuation of the protective circuit. Make certain that the FUNCTION switch is at OFF before connecting the DC power cable to the DC power outlet. Verify that the DC power source voltage falls between 12 to 15V. Make certain that the power switch is at OFF, and connect the DC power cable to the DC outlet of the set.

SECTION V INSIDE VIEW

(TOP)



(BOTTOM)


R137 (Q25) Idling Adj.
Q24 2SC1947
R133 (Q24) Idling Adj.
ALC Adj. (SSB)
Q23 2SC2053
Helical Cavity
IC3 AF Amp
FL1 (1st IF, Xtal Filter)
R145 (APC Adj.)
X1 (2nd OSC)
IC2 (T. Mix)
R159 (High Power Adj.)
R158 (Low Power Adj.)
J4 (SSB input)
X2 (10.7MHz)
IC4 (Limiter Amp.)
Q25 2SC2094
C137, C140 (Final Trimmer)
R139 (RF Meter Adj.)
R138 (SWB Balance Adj.)
P-2 (Q24, Q25 Meter Adj.)
Q2(RF Amp. FET)
L41 (Input Filter)
DS1 (Ceramic Discriminator)
R31 (FM. S Meter Adj.)
R38 (FM. S Meter Full Adj.)
IC 1 (2nd IF Amp)
R95 (Mod. Linearity Adj.)
R86 (Mic. Gain)
R106 (FM Mod. Adj.)

SECTION VI OTHER REMARKS

Do not attempt to connect or remove the power cable, antenna, external speaker or microphone while the power switch is ON. This may damage your set.

Do not transmit without connecting the antenna.

This set is made for the negative (–) ground system. The set can not be installed to a car having (+) positive ground without modification.

If fuses are blown, check the cause of trouble before replacing them with new ones.

If the power switch is turned on and off rapidly, the frequency display may indicate erroneous figures. If erroneous figures are shown, turn off the power switch and wait several seconds before turning the switch on again.

The set has been aligned very accurately with precision test intruments. Never try to alter the setting of variable resistors, coils and trimmers inside the set.

The PLL unit contains a C MOS LSI which is the heart of the set and requires extreme care and knowledge in handling. Therefore, the unit is sealed and when the seal is broken the warranty is voided. Repair of this unit can be expensive.
by qualified persons.

In addition to the PLL unit, the digital-driver unit also utilizes a C MOS IC. As the IC is very sensitive and will be damaged by excessive current or a large static potential, only a skillful technician familiar with handling the C MOS IC should check the circuitry. Even when a skillful technician checks the circuit, the following cautions must be taken.

The soldering iron tip, tools and measuring instruments must be properly grounded.

Do not plug in or unplug the C MOS IC or use a soldering iron while the unit is powered.

Do not apply signals to C MOS IC input terminals without the power being applied. Do not use a multimeter to measure resistance in the IC circuit unless power is applied.

Do not apply voltages other than 0.5 to +5V to the C-MOS IC circuit.

SECTION VII OPERATION

Reception

Preliminary procedures. After the antenna and the microphone have been connected, set knobs and switches as follows.

FUNCTION Switch	OFF (middle)
VFO Switch	A
VOL (Volume) Knob	fully counter-clockwise
SQL (Squelch) Knob	fully counter-clockwise

After setting, place the FUNCTION switch to "SIMPLEX" the power. The meter is illuminated, RECEIVE indicating lamp lights and a frequency of (4000) is shown on the frequency display window. This shows the set is now operating in (144,000MHz).

HOW TO TUNE

Tuning Knob

The tuning knob is provided with a click stop and it tunes smoothly even as a mobile station. Frequency drift due to vibration turning the tuning knob is prevented by the click stop. Transmitting and receiving frequencies are shown by four LED (Light Emmiting Diodes) digits in the frequency display window in steps of 100Hz. Rotating the tuning dial clockwise will increase the frequency. In FM, each vernier movement is equivalent to a 5KHz frequency shift and one complete rotation equals a 250KHz change. Clockwise rotation increase the frequency. 100Hz digits are not shown at the frequency display window. but can be read on the vernier scale of the tuning knob.

If the tuning dial is rotated furthre to increase the frequency after reaching the upper end of the frequency band (147.995MC), the frequency will return to the lower end of the frequency band (144.000) automatically and will continue to increase from that point. Conversely, further rotation of dial to decrease the lower end, 144.000MHz, will return the frequency to the upper end (147.995). Thus, no off-band tuning is given. The frequency shown at the frequency display window is the carrier frequency of each communication mode of FM, SSB (USV) and CW, thus eliminating a need for returning or recalibration of the dial when the mode is changed.

VFO Switch

This switch selects either the "A" or "B" VFO built into the set. When set on "A" or "B", both reception and transmission frequencies are controlled by that VFO and that is the frequency shown in the frequency display window. The frequency of "A" VFO is retained and memorized in the LSI before switching to "B" VFO, and "A" VFO will function at that same frequency when the switch is restored to "A". This capability alllows effective communication using "A" VFO as a fixed calling frequency while searching for QSY frequencies with "B" VFO. It is also used for a temporary memory device. Rotation of the tuning dial will vary the frequency of the VFO functioning and change the corresponding frequency display window in any VFO operation mentioned above.

DUPLEX PROGRAM INSTRUCTIONS

1. Set VFO switch to "A/Norm" VFO.
2. Set FUNCTION switch to SIM(simplex).
3. Push in "ENTER" button so it locks in (ENTER).
4. Enter Transmit frequency (Example; 146.000MHz)
5. Set VFO switch to "B/Rev" position.
6. Enter receive frequency (Example; 146.600MHz).
7. Set VFO switch in a position and FUNCTION switch is Dup (Duplex) position.
8. Push in "Enter" button so it pops out.
9. Frequency DISPLAY will show receive frequency (146.600MHz) and when the PTT button is pressed, the TRANSMIT frequency (146.000MHz) is displayed. Rotating the tuning knob clockwise will increase the receive frequency and the TRANSMIT frequency will follow at the 600KHz difference.

Duplex Program Instructions

In the U.S.A. 2 meter FM deplex plan, the TRANSMIT frequency is generally 600KHz lower than the RECEIVE frequency between 146–147MHz and 600KHz higher than the receiver frequency between 147–148MHz.

The IC-245 has a built in circuit, which will automatically reverse the relationship of the dual VFO's in the duplex mode.

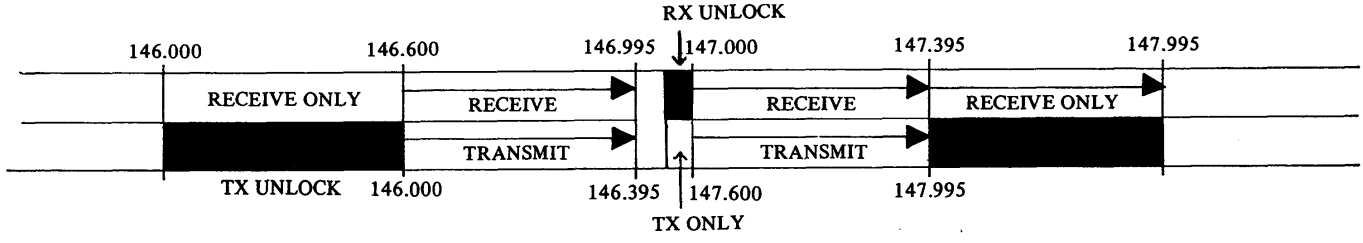
In duplex (TX frequency "A" VFO, RX frequency "B" VFO) set the normal–600KHz difference between the transmit and receive frequencies (TX–600KHz). When the Receive frequency is brought up to 147.000MHz frequency, the receiver display will flash on and off, this will continue even when the tuning control is rotated until the transmit frequency reaches 147.000MHz. Then the changeover circuit will automatically reverse the relationship of the VFO's. The originally higher Receive frequency ("A" VFO) will revert to the lower frequency ("B" VFO). The originally lower Transmit frequency ("B" VFO) will revert to the higher frequency ("A" VFO). Therefore, the VFO's are actually reversed and the normal +600KHz transmit to receive relationship is achieved. (Between 147 and 148MHz).

Likewise, when the receive frequency is brought down to 146.995 (the first step past 147.000MHz), the opposite will occur, and the VFO's revert to the nomal transmit/receive relationship for 146–147MHz.
In the Reverse Duplex Mode, when tuning up past 146.995 or down past 147.000, the

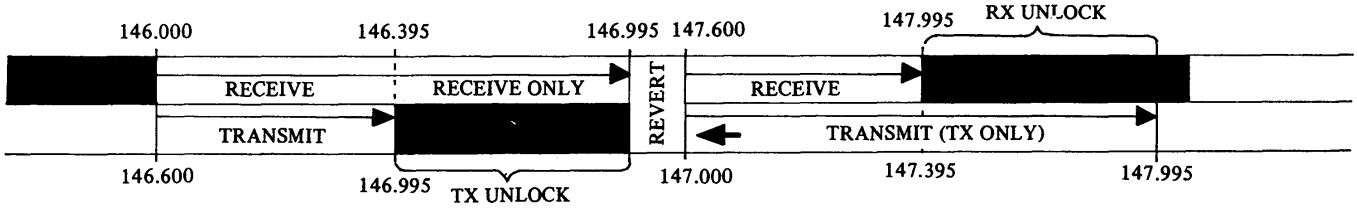
receive frequency readout will not flash indicating unlock. Auto changeover will occur when the frequency reaches the revert point. Flashing in Normal Duplex may be stopped by placing the VFO switch in the Simplex position.
The charts are for 600KHz split between "A" and "B" VFO's, but are representative of the action of most any split.

Note:
Any frequency split upto 955KHz can be used however the actually usable frequency range will be reached the greater the split used.

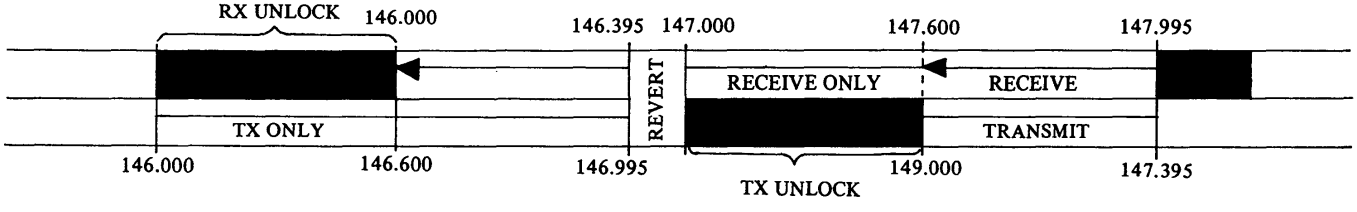
TUNING UP OR DOWN IN NORMAL DUPLEX



TUNING UP FROM 146.000 IN REVERSE DUPLEX



TUNING DOWN FROM 147.995 IN REVERSE DUPLEX



Memory

This set utilizes a C MOS LSI for setting the frequency. The memorized frequency remains as is when the power is off, however, the LSI is partially powered. In this set, the function switch need not remain ON (up) to keep the LSI memory working. However, the memory is lost when the power cable is disconnected from the power source or the AC power source is unplugged. If you wish to maintain frequency memory during periods when power is disconnected, connect batteries as shown in Fig. 10 to the DC power outlet to supply power when the power is off. The LSI will operate with battery voltage of 6-12V, but that of 9V is best. As current consumption is about 5mA, a dry cell battery can be used for a considerable period (2 months with a U-1 type dry cell battery).

FM Reception

Turn the VOL (volume) knob clockwise slowly until readable FM noise is heard. Search for an incoming signal with the tuning knob. When the signal is tuned in, the S meter pointer shows maximum deflection swings and voice signals are heard. Carefully tune a signal by rotating the tuning knob to obtain the widest swing of the S meter pointer and to hear distortion free woice signals tuned in without distortion.

SQL (Squelch) Knob

With the squelch knob turned fully counter clockwise and the set on a frequency where no signal is received, FM noise will be heard. Turn the SQUELCH knob clockwise slowly to the point where the noise is abruptly suppressed and the receive lamp turns off. With the SQUELCH knob at this setting, the set is silent until a signal is received or a station is tuned in. Then the set will receive signals and the RECEIVE lamp will light up. If in-coming signals are weak or the set is used as a mobile radio, where the SQUELCH operation is unstable, readjust the SQUELCH knob as required.

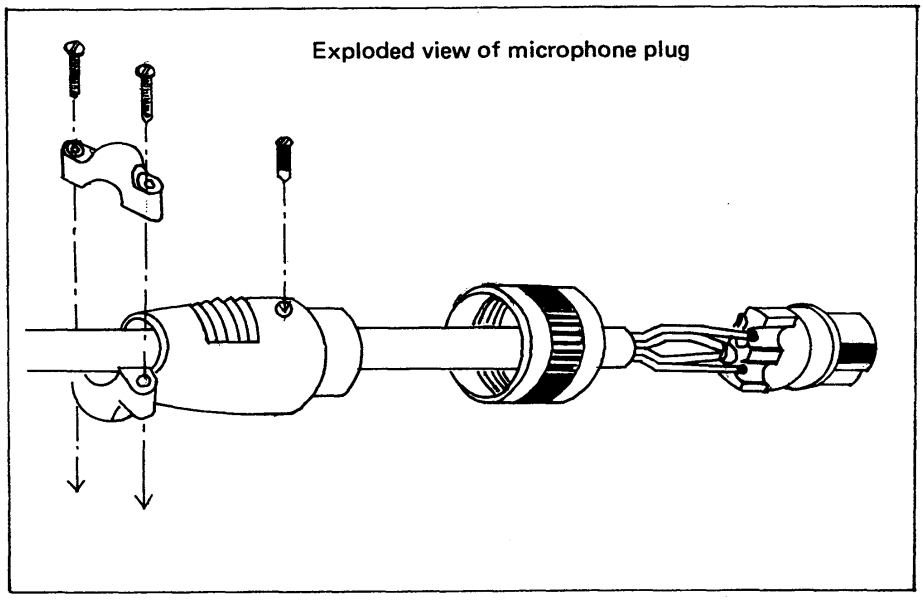
FM Transmission

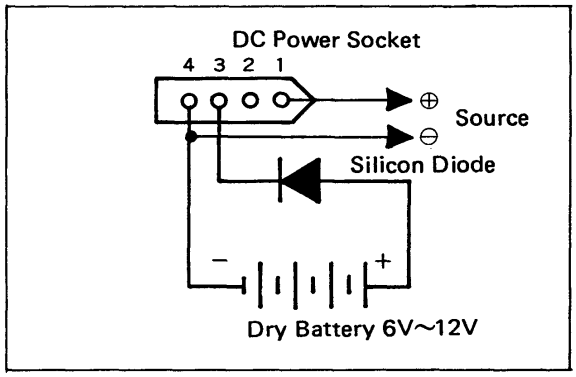
Depress the PTT switch on the microphone (press-to-talk). The TRANSMIT indicator lamp will light and the power meter will swing to the level of the power showing the set is ready to transmit. An FM signal will be transmitted when a voice a activates the microphone. Releasing the PTT button will return the set to the reception operation and the TRANSMIT indicating lamp off. When transmitting the meter is automatically changed to the RF power level meter and is calibrated in terms of relative power output, not in absolute value (1, 2, 3W and so on). The meter is adjusted to make the pointer swing about 80% of the full RF scale with 10W output into a pure resistance load of 50 ohms (terminated type RF power meter). The meter deflection will vary according to antenna matching.
antenna matching.

Other Facility

Auto Dimmer

The photosensor actuates the dimmer circuit by detecting darkness around the set such as at night. When actuated, the lamps for meters and the frequency display window are dimmed. This furnishes easier meter and frequency indicator reading by eliminating the dazzling effect of bright lamps in dark surroundings.

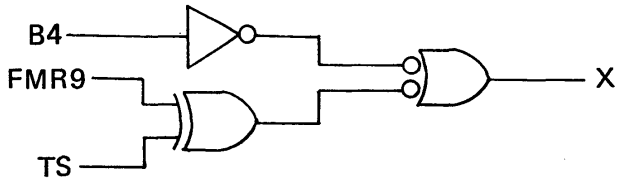

Exploded view of microphone plug


DC Power Socket
4 3 2 1
⊕
⊖
Source
Silicon Diode
−
+
Dry Battery 6V~12V

X-Control

B4	FM9	TS	X
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	*	*	1

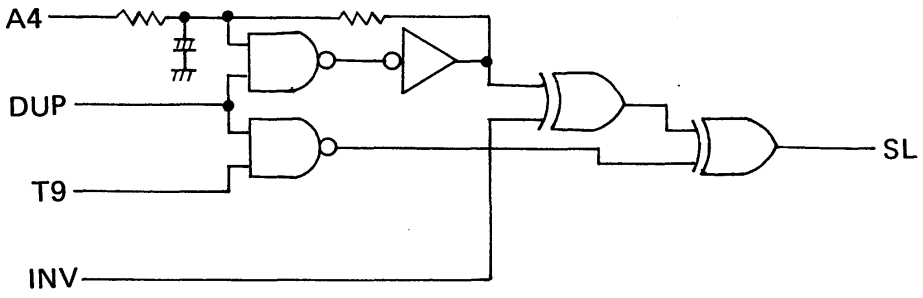
* = 0 or 1



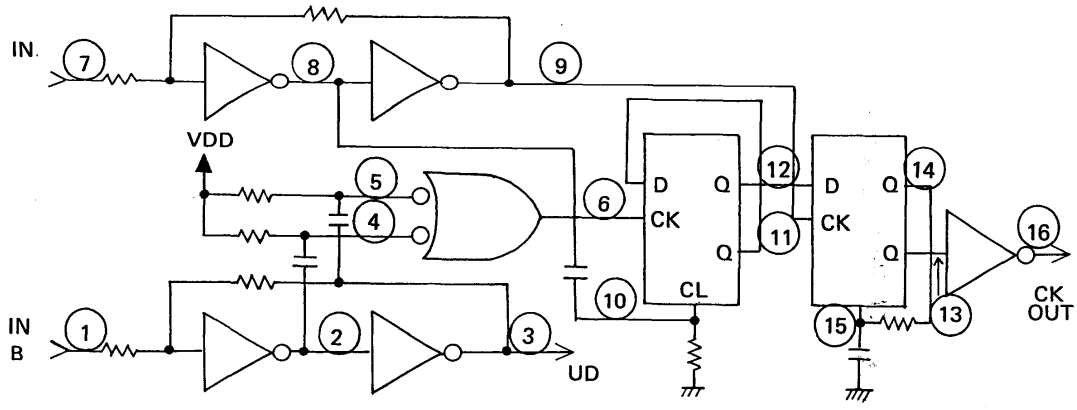
SL-Control

DUP	T9	A4	INV	SL
0	*	*	0	1
0	*	*	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

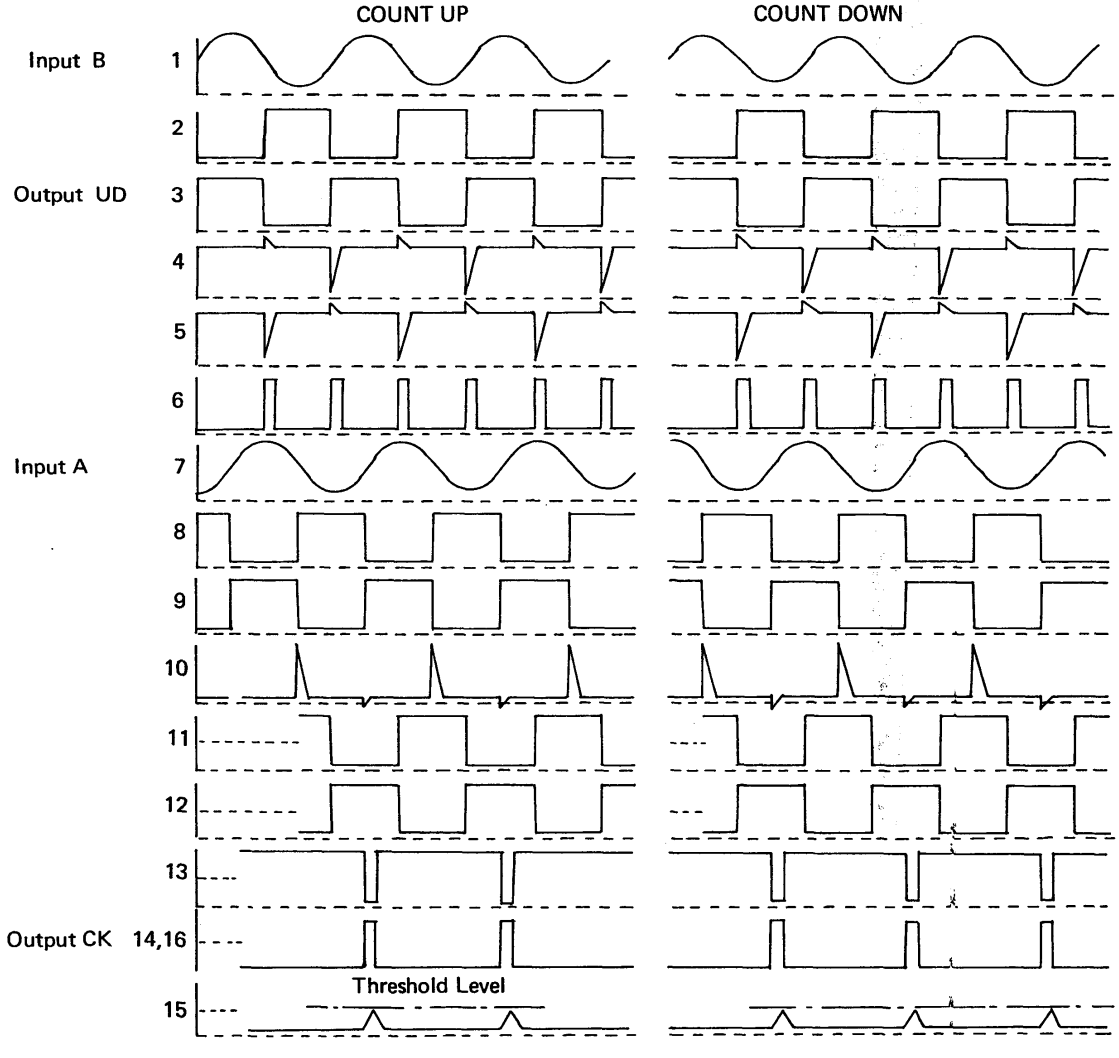
* = 0 or 1

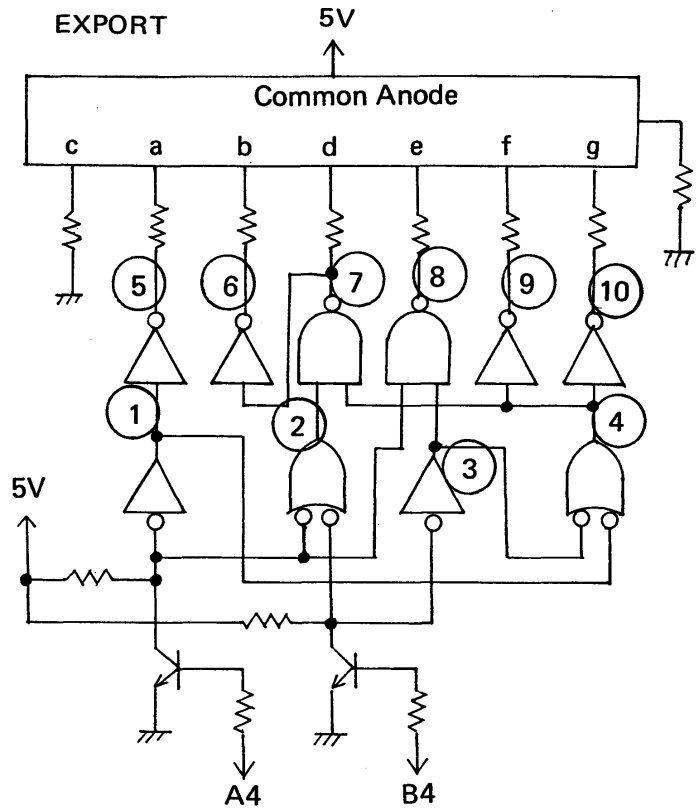


DIAL PHASE CLOCK



TIMING CHART

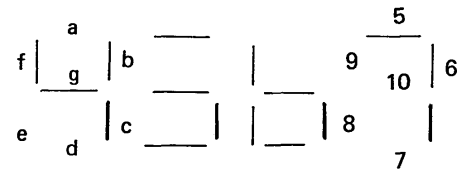




TRUTH TABLE

EXPORT

Input		Output									
B4	A4	5	6	7	8	9	10	1	2	3	4
0	0	1	0	1	1	0	0	0	0	0	1
0	1	0	1	0	1	0	0	1	1	0	1
1	0	1	1	0	0	0	0	0	1	1	1
1	1	0	0	1	1	1	1	1	1	1	0



SECTION IX PARTS LIST

EF UNIT

R-1	Valiable	PR-15K BLOK
R-2	Valiable	PR-15K ALOK
S-1	Switch	S2023-48C
S-2	Switch	S2012-48C
S-3	Switch	M02-6102
	Switch	M02-6106
D-1	LED	303E
D-2	LED	103S
D-3	Diode	1SS53
D-5	Diode	GP08A
D-6	Diode	GP08A
C-1	Ceramic	20P 50V
C-2	Ceramic	.01 50V
L-1	Coil	LA-115
PL-1	Lamp	White 5ϕ 50mA 14V
M-1	Meter	YN-40A-2
SP-1	Speaker	66-52UT

DRIVER

IC1	IC	M53247P
IC2	IC	M53247P
IC3	IC	M53247P
IC4	IC	M53204P
IC5	IC	M53200P
IC6	IC	μPD4011C
IC7	IC	μPD4011C
IC8	IC	μPD4013C
Q1	Transistor	JA1600G
Q2	Transistor	2SC945R
Q3	Transistor	2SC945R
Q4	Photo Transistor	PH101
Q5	Photo Transistor	PH101
D1	LED	SR106C
D2	LED	SR106C
C1	Milar	0.0047μ 50V
C2	Ceramic	470P 50V
C3	Ceramic	470P 50V
C4	Ceramic	0.0022μ 50V
C5	Ceramic	0.01μ 50V

DRIVER (DISPLAY)

IC9	7-Seg LED	TLR313
IC10	7-Seg LED	TLR313
IC11	7-Seg LED	TLR313
IC12	7-Seg LED	TLR313

MAIN UNIT

R31	Trimmer	3K ohm FR-10
R38	Trimmer	10K FR-10
R55	Thermistor	33D28
R86	Trimmer	10K ohm FR-10
R95	Trimmer	3K ohm FR-10
R105	Thermistor	33D28
R106	Trimmer	1K ohm FR-10
R113	Thermistor	23D29
R133	Trimmer	1K ohm FR-10
R135	Trimmer	5K ohm FR-10
R137	Trimmer	100 ohm FR-10
R138	Trimmer	100 ohm FR-10
R139	Trimmer	30K ohm FR-10
R145	Trummer	100K ohm FR-10
R158	Trimmer	3K FR-10
R159	Trimmer	3K FR-10
C1	Ceramic	0.001 μF 50V
C2	Ceramic	0.001 μF 50V
C3	DIP MICA	10pF 50V
C4	Ceramic	0.01 μF 50V
C5	Ceramic	0.01 μF 50V
C6	Ceramic	0.01 μF 50V
C7	Ceramic	0.01 μF 50V
C8	Ceramic	0.01 μF 50V
C9	Ceramic	0.01 μF 50V
C10	Ceramic	0.01 μF 50V
C11	Ceramic	30 pF 50V
C12	Ceramic	0.01 μF 50V
C13	Stycon	100 pF 50V
C14	Stycon	200 pF 50V
C15	Ceramic	0.01 μF 50V
C16	Ceramic	2 pF 50V
C17	Milar	0.039 μF 50V
C18	Milar	0.039 μF 50V
C19	Milar	0.01 μF 50V
C20	Milar	0.039 μF 50V
C21	Milar	0.039 μF 50V
C22	Milar	0.039 μF 50V
C23	Milar	0.01 μF 50V
C24	Milar	0.056 μF 50V
C25	Milar	0.01 μF 50V
C26	Milar	0.001 μF 50V
C27	Milar	0.056 μF 50V
C28	Milar	0.01 μF 50V

C29	Electrolytic	10 μF / 16V
C30	Milar	0.01 μF 50V
C31	Milar	0.01 μF 50V
C32	Milar	0.001 μF 50V
C33	Electrolytic	10 μF / 16V
C34	Milar	0.056 μF 50V
C35	Milar	0.056 μF 50V
C36	Milar	0.056 μF 50V
C37	Milar	0.056 μF 50V
C38	Milar	0.056 50V
C39	Electroytic	4.7 / 16V
C40	Milar	0.0022 50V
C41	Milar	0.001 50V
C42	Milar	0.0047 50V
C43	Milar	.022 50V
C44	Milar	.0047 50V
C45	Electrolytic	1M / 50V
C46	Milar	0.01 50V
C47	Milar	0.01 50V
C48	Milar	0.039 50V
C49	Milar	0.0022 50V
C50	Milar	0.1μ 50V
C51	Milar	0.039 50V
C52	Electrolytic	1. / 50V
C53	Electrolytic	10 / 16V
C54	Electrolytic	10 / 16V
C55	Electrolytic	3.3 / 25V
C56	Electrolytic	3.3 / 25V
C57	Electrolytic	3.3 / 25V
C58	Milar	0.01 50V
C59	Electrolytic	33 / 10V
C60	Electrolytic	0.47 / 50V
C61	Milar	0.01 50V
C62	Milar	0.01 50V
C63	Ceramic	100p 50V
C64	Milar	0.001 50V
C65	Milar	0.001 50V
C66	—	—
C67	Electrolytic	4.7 / 16V
C68	Milar	0.001 50V
C69	Electrolytic	47 / 10V
C70	Electrolytic	4.7 / 16V
C71	Electrolytic	220 / 10V
C72	Milar	0.01 50V
C73	Ceramic	100p 50V
C74	Electrolytic	33 / 10V
C75	Milar	0.001 50V
C76	Electrolytic	100 / 10V
C77	Electrolytic	4.7 / 16V

C78	Milar	0.01 50V
C79	Ceramic	100p 50V
C80	Milar	0.01 50V
C81	Electrolytic	220 / 10V
C82	Milar	0.0033 50V
C83	Milar	0.1 50V
C84	Milar	0.0047 50V
C85	Milar	0.01 50V
C86	Ceramic	10p 50V
C87	Ceramic	0.01 50V
C88	Ceramic	200p 50V
C89	Ceramic	100p 50V
C90	Ceramic	10p 50V
C91	Ceramic	0.01 50V
C92	Ceramic	0.01 50V
C93	Ceramic	0.01 50V
C94	Ceramic	0.01 50V
C95	Ceramic	6p 50V
C96	Ceramic	10p 50V
C97	Ceramic	0.35p 50V
C98	Ceramic	0.35p 50V
C99	Ceramic	0.35p 50V
C100	Ceramic	0.35p 50V
C101	Ceramic	6p 50V
C102	Ceramic	6p 50V
C103	Ceramic	6p 50V
C104	Ceramic	6p 50V
C105	Ceramic	4p 50V
C106	Ceramic	0.001 50V
C107	Ceramic	0.01 50V
C108	Ceramic	0.01 50V
C109	Ceramic	0.01 50V
C110	Electrolytic	4.7 / 16V
C111	Ceramic	0.001 50V
C112	Ceramic	0.5p 50V
C113	Ceramic	7p 50V
C114	Ceramic	30p 50V
C115	Ceramic	0.01 50V
C116	Ceramic	0.01 50V
C117	Ceramic	0.001 50V
C118	Ceramic	0.001 50V
C119	Trimmer	CVO5C120
C120	Ceramic	15P 50V
C121	Trimmer	CVO5C120
C122	Electrolytic	10 / 16V
C123	Ceramic	0.01 50V
C124	Electrolytic	47 / 16V
C125	Ceramic	0.01 50V
C126	Ceramic	0.001 50V

C127	Electrolytic	47μ / 10V
C128	Ceramic	0.01 50V
C129	Trimmer	CVC20-11
C130	Ceramic	15P 50V
C131	Ceramic	0.001 50V
C132	Trimmer	CVE50-11
C133	Ceramic	68p 50V
C134	Electrolytic	330 / 16V
C135	Ceramic	0.01 50V
C136	Ceramic	0.001 50V
C137	Trimmer	70p type-C
C138	Ceramic	20p 50V
C139	Ceramic	50p 50V
C140	Trimmer	70p type-C
C141	Ceramic	20p 50V
C142	Ceramic	2p 50V
C143	Ceramic	30p 50V
C144	Ceramic	6p 50V
C145	Ceramic	15p 50V
C146	Ceramic	0.01 50V
C147	Ceramic	1p 50V
C148	Ceramic	0.01 50V
C149	Ceramic	20p 50V
C150	—	—
C151	Electrolytic	1 / 50V
C152	Electrolytic	3.3 / 25V
C153	Ceramic C	0.01 50V
C154	Electrolytic	3.3 / 35V
C155	Electrolytic	33 / 10V
C156	Electrolytic	0.47 / 50V
C157	Ceramic	0.001 50V
C158	Electrolytic	10 / 16V
C159	Electrolytic	47 / 16V
C160	Electrolytic	220 / 10V
C161	Milar	0.0033 50V
V162	Electrolytic	47 / 16V
V163	Milar	0.1 50V
C164	Electrolytic	470 /16V
C163	Electrolytic	47 / 10V
C166	Electrolytic	10 / 16V
C167	Ceramic	0.01 50V
C168	Ceramic	0.04 50V
C169	Ceramic	0.001 50V
C170	Ceramic	0.01 50V
C171	Electrolytic	0.47 / 50V
C172	Ceramic	6P 50V
C173	Ceramic	0.01 50V
C174	Ceramic	0.01 50V
C175	Ceramic	0.01 50V
C176	Ceramic	100p 50V
C177	Ceramic	0.01 50V
C178	Ceramic	0.001 50V
C179	Ceramic	0.001 50V
C180	Ceramic	20p 50V
C181	Ceramic	0.01 50V
C182	Ceramic	0.02 50V

MAIN UNIT

IC1	IC	μpc577H
IC2	IC	TA7045M
IC3	IC	μpc575C2
IC4	IC	BA-401
Q1	Transistor	2SA639 Q
Q2	F E T	3SK40 K
Q3	F E T	3SK40 M
Q4	Transistor	2SC945 P
Q5	F E T	2SK49 H2
Q6	Transistor	2SC945 R
Q7	Transistor	2SC945 P
Q8	Transistor	2SC945 P
Q9	Transistor	2SC1571 G
Q10	Transistor	2SC945 P
Q11	Transistor	2SC945 P
Q12	Transistor	2SC945 P
Q13	Transistor	2SC945 P
Q14	Transistor	2SC1571 G
Q15	Transistor	2SC1571 G
Q16	Transistor	JA1050 G
Q17	Transistor	2SC1571 G
Q18	Transistor	2SC945 R
Q19	Transistor	2SC945 R
Q20	Transistor	2SC945 P
Q21	Transistor	2SC945 P
Q22	F E T	3SK40 M
Q23	Transistor	2SC2053
Q24	Transistor	2SC1947
Q25	Transistor	2SC2094
Q26	Transistor	JA1050 G
Q27	F E T	2SK44 D
Q28	Transistor	JA1050 G
Q29	Transistor	2SC945 P
Q30	Transistor	JA1600 G
Q32	Transistor	2SC945 P
Q33	Transistor	2SD359 D
D1	Diode	1SS55
D2	Diode	1SS55
D3	Diode	1SS53

D4	Diode	1SS53
D5	Diode	1SS53
D6	Diode	1N60
D7	Diode	1N60
D8	Diode	1N60
D9	Diode	1N60
D10	Diode	1N60
D11	Diode	1S1555
D12	Diode	1SS53
D13	Diode	1N60
D14	Diode	1N60
D15	Vari Cap	1S2688C
D16	Diode	1SS53
D17	Diode	1SS53
D18	Diode	1SS53
D19	Diode	1SS53
D20	Diode	1SS53
D21	Diode	1SS53
D22	Diode	1S1555
D23	Diode	1S1555
D24	Diode	1S2473
D25	Diode	1S2473
D26	Diode	1N60
D27	Diode	1N60
D28	Diode	1SS53
D29	Diode	1SS53
D30	Diode	1SS53
D31	Diode	1SS53
D32	Diode	1SS53
D33	Diode	1SS53
D34	Diode	1SS53
D35	Diode	1SS53
D36	Diode	XZ096
D37	Diode	SR10N-2R
L1	Coil	LS-4
L2	Coil	LB-1-3A
L3	Coil	LB-1-1
L4	Coil	LB-1-1
L5	Coil	LB-1-1
L6	Coil	LB-1-3A
L7	Coil	LR-17
L8	Coil	LS-81
L9	Coil	101
L10	Coil	LS-79
L11	Coil	LS-20
L12	Coil	102
L13	Coil	LS-16
L14	Coil	102
L15	Coil	LS-80

L16	Coil	100
L17	Coil	101
L18	Coil	LS-66 A
L19	Coil	101
L20	Coil	LS-73
L21	Coil	LS-73
L22	Coil	LS-73
L23	Coil	LS-73
L24	Coil	LS-73
L25	Coil	LS-73
L26	Coil	LS-73
L27	Coil	LA-71
L28	Coil	LA-97
L29	Coil	LA-97
L30	Coil	LW-1
L31	Coil	LA-96
L32	Coil	LA-31
L33	Coil	LW-1
L34	Coil	LA-74
L35	Coil	LA-73
L36	Coil	LW-5
L37	Coil	LA-71
L38	Coil	LA-71
L39	Coil	LR-13
L40	—	—
L41	Choke Trans	TC-1B
L42	Coil	LS-73
L43	Choke Coil	101
FL1	Filter	10M20A
FL2	Filter	CFU-455E
FL3	Filter	CFU-455E
DS 1	Ceramic Discri	455D
X-1	Xtal	HC/18μ 10.245MHz
X-2	Xtal	HC/18μ 10.703MHz
L44	Choke Coil	100

PLL

R17	Trimmer	RGP102 B30K
R18	Trimmer	RGP102 B3.3K
R20	Thermistor	33D28
R64	Trimmer	FR-10 10K
C1	Chemical	4.7μ 25V
C2	Ceramic	.01μ 50V
C3	Chemical	47μ 10V

C4	Chemical	22μ 16V
C5	Chemical	47μ 10V
C6	Chemical	4.7μ 50V
C7	Dip-mica	39p 50V
C8	Dip-mica	39p 50V
C9	Trimmer	CVO5D180
C10	Milar	.1μ 50V
C11	Chemical	10μ 16V
C12	Milar	.0047 50V
C13	Chemical	47μ 10V
C14	Ceramic	0.01μ 50V
C15	Chemical	33μ 25V
C16	Milar	.0022μ 50V
C17	Milar	.0047μ 50V
C18	Chemical	10μ 16V
C19	Ceramic	.01μ 50V
C20	Ceramic	.01μ 50V
C21	Ceramic	.01μ 50V
C22	Ceramic	40p 50V
C23	Dip-mica	15p 50V
C24	Ceramic	40p 50V
C25	Ceramic	.01μ 50V
C26	Ceramic	.01μ 50V
C27	Ceramic	.01μ 50V
C28	Ceramic	.01μ 50V
C29	Ceramic	.01μ 50V
C30	Ceramic	.01μ 50V
C31	Ceramic	.01μ 50V
C32	Ceramic	.01μ 50V
C33	Ceramic	.01μ 50V
C34	Trimmer	CVO5D180
C35	Trimmer	CVO5D120
C36	Chemical	3.3μ 25V
C37	Ceramic	.001 50V
C38	Sticon	820P 50V
C39	Sticon	200P 50V
C40	Ceramic	.01μ 50V
C41	Sticon	100P 50V
C42	Sticon	820P 50V
C43	Ceramic	.01μ 50V
C44	Dip-mica	39P 50V
C45	Ceramic	.01μ 50V
C46	Ceramic	10P 50V
C47	Ceramic	.01μ 50V
C48	Ceramic	.01μ 50V
C49	Ceramic	8P 50V
C50	Ceramic	.5P 50V
C51	Ceramic	10P 50V
C52	Ceramic	0.01μ 50V

C53	Milar	.1μ 50V
C54	Ceramic	.01μ 50V
C55	Chemical	22μ 16V
C56	Ceramic	.01μ 50V
C57	Chemical	22μ 16V
C58	Ceramic	.01μ 50V
Feed Through		
C100	Kantsu-con	B363YN820M
C101	Ceramic	470 pF 50V
C102	Ceramic	470 pF 50V
C103	Ceramic	470 pF 50V
C104	Ceramic	0.01μ 50V
C105	Ceramic	NPO 20p 50V
Q1	Transistor	2SC945
Q2	FET	2SK44
Q3	Transistor	2SC945
Q4	Transistor	2SC1312-G
Q5	—	—
Q6	Transistor	2SC1312-G
Q7	Transistor	2SC945
Q8	Transistor	JA1050-G
Q9	Transistor	2SC385
Q10	Transistor	2SC763-C
Q11	Transistor	2SC763-C
Q12	Transistor	2SC945
IC1	LSI	SC3062
IC2	IC	μPD4011
IC3	IC	μPD4030
IC4	IC	TA7045M
IC5	IC	μPC577H
IC6	IC	MC7805CP
IC7	DC Converter	DP-1
IC8	IC	MC78L08
XI	Xtal	HC-18/U 5.000MHz
X2	Xtal	HC-18/U 14.700MHz
X3	Xtal	HC-18/U 14.922MHz
D2	Diode	1SS53
D3	Diode	1SS53
D4	Diode	1SS53
D5	Diode	1SS53
D6	Diode	1SS53
D7	Varicap	MV-201
D8	Varicap	MV-201

D9	Diode	1SS53
D10	Diode	1SS53
D11	Diode	1SS53
D12	Diode	1SS53
D13	Varicap	ITT410
D14	Varicap	ITT410
L1	Trans	LR-11B
L2	Choke	100
L3	Coil	LS-93
L4	Coil	LS-2
L5	Coil	LS-3A
L6	Coil	LS-3A
L7	Choke	101
L8	Choke	102

DIMMER

Q201	Transistor	2SC945-F
Q202	Transistor	2SC945-P
Q203	Transistor	JA1050-G
Q204	Transistor	JA1600-G
D201	Diode	1SS53
R201	Trimmer	100K FR-10
R202	Trimmer	1K ohm R25J
R203	Trimmer	1K R25J
R204	Trimmer	4.7K R25J
R205	Trimmer	1K R25J
R206	Trimmer	470 R25J
R207	Trimmer	100 R25J
R208	Trimmer	1K R25J
R209	Trimmer	10K R25J
R210	Trimmer	220 R25J
R211	Trimmer	22K R25J
R212	Trimmer	1K R25J
C201	Electrolytic	4.7 / 16V
C202	Electrolytic	10μ 16V

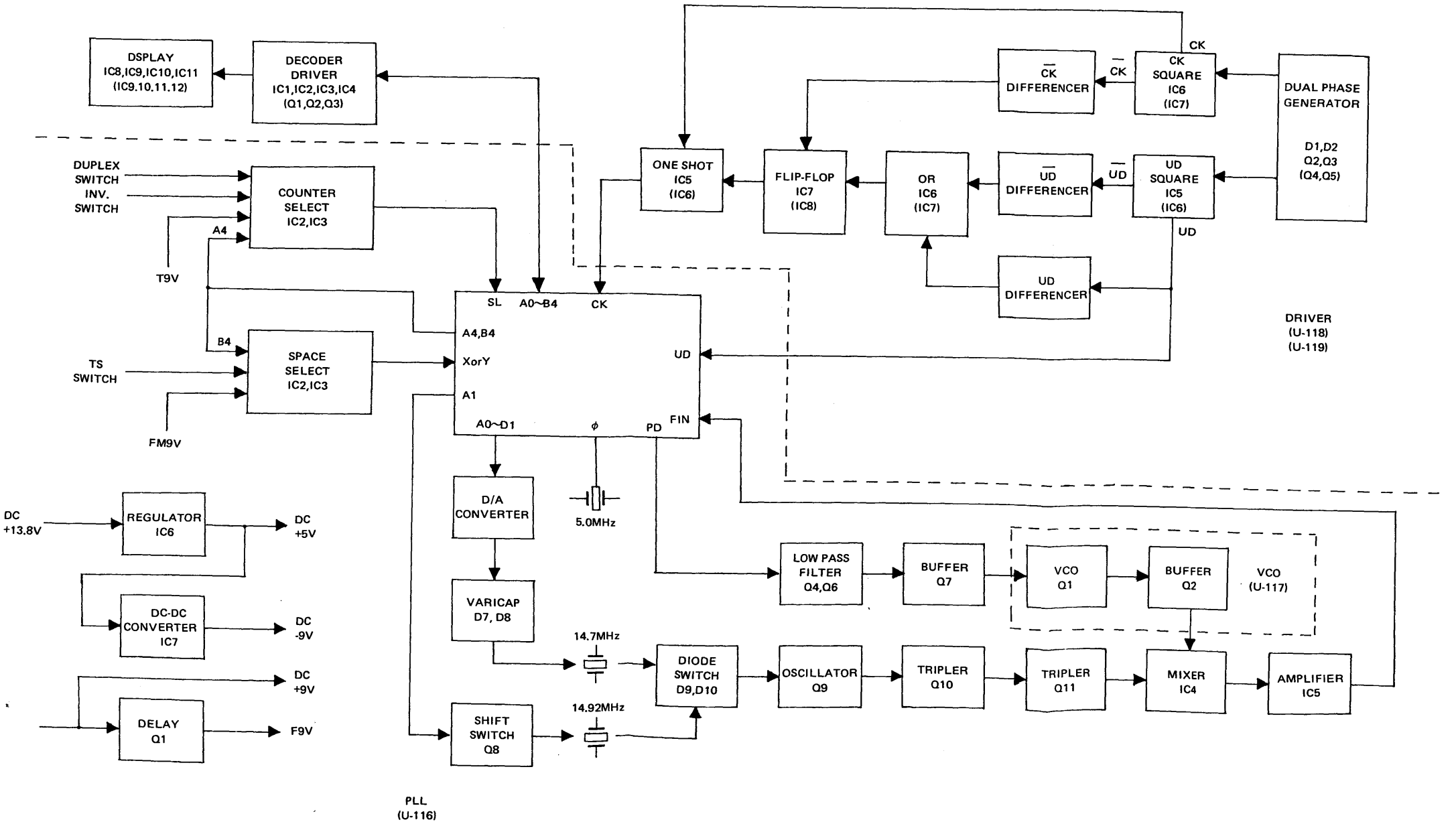
SECTION X VOLTAGE CHARTS

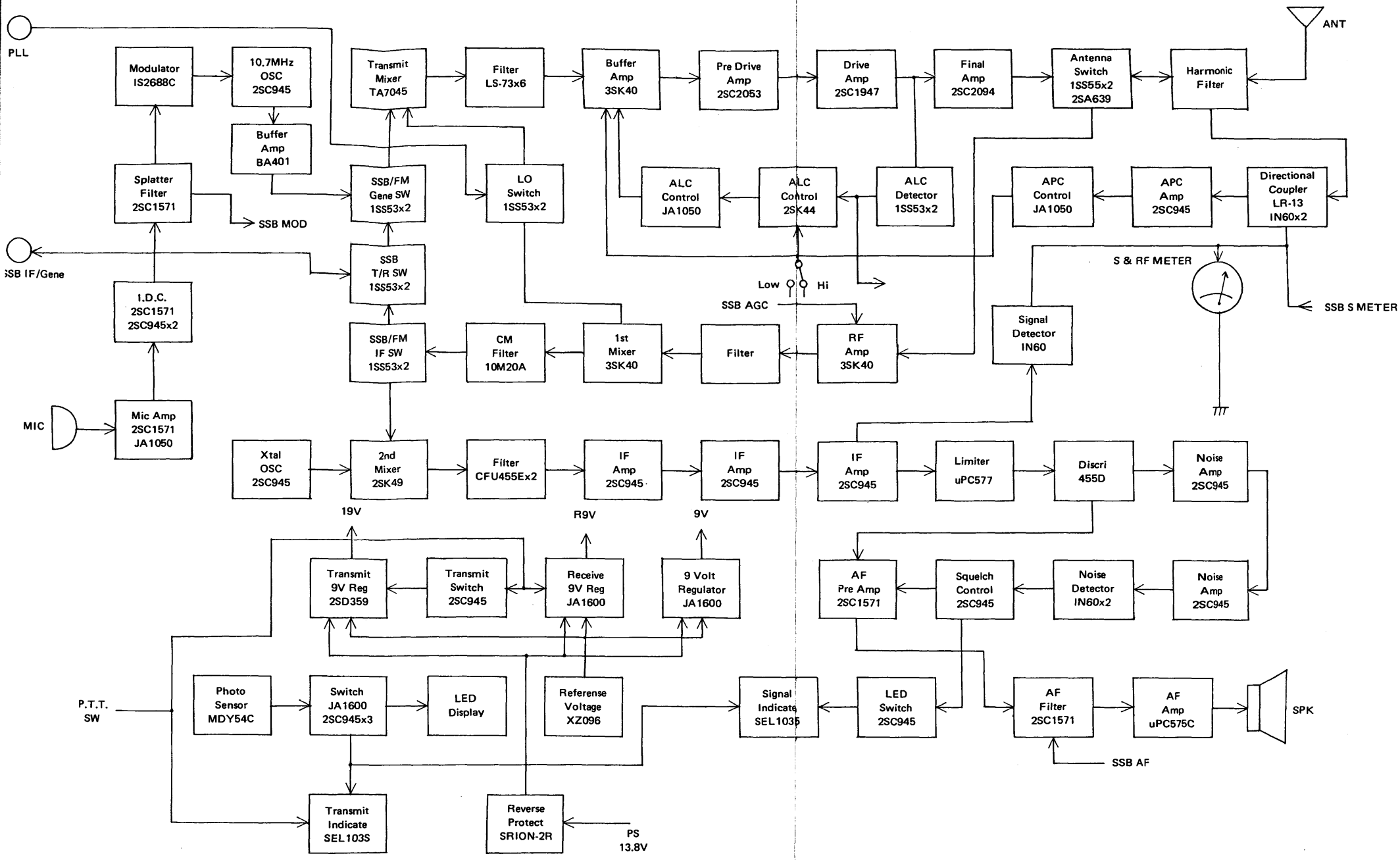
Unit	No.	Transmit				Receive				Notes
		Base or Gate 1	Gate 2	Collector or Drain	Emitter or Source	Base or Gate 1	Gate 2	Collector or Drain	Emitter or Source	
U-116 PLL	Q1	8.5		8.6	7.8					
,,	Q2	0		8.6	3.9					
,,	Q3	0		0.9	0					
,,	Q4	0		7.8	0					
,,	Q6	0		7.8	0.3					
,,	Q7	7.5		7.6	7.0					
,,	Q8	4.5		5.0	5.0					
,,	Q9	1.8		8.3	1.0					
,,	Q10	1.4		8.4	0.8					
,,	Q11	1.4		8.4	0.8					

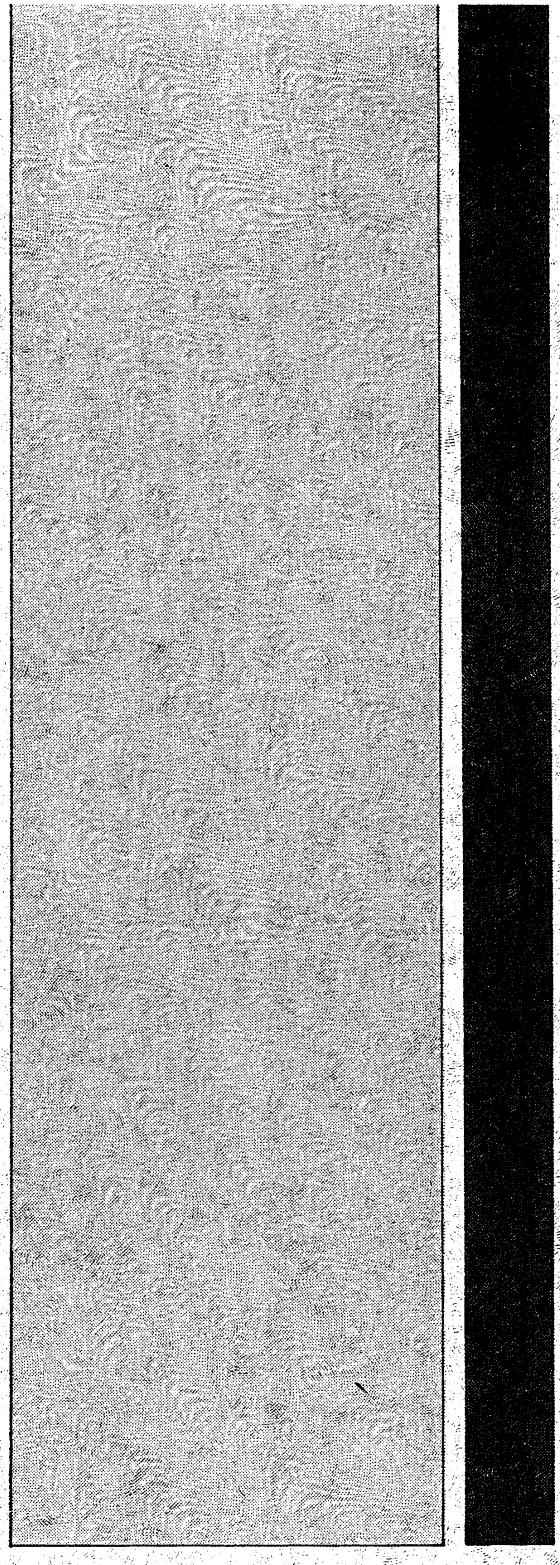
		Transmit Pin No.														
Unit	No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Notes
U-116 PLL	IC-1						(see below)									
	IC-2	0	0	5	0	0	5	0	0	5	5	5	0~5	0	5	
	IC-3	5~0	0	0	0	5	5	0	5	0	5	0~5	5	5	5	
	IC-4	5	2.6	E	1.9	5	6.7	7.5	7.5							
	IC-5	5.1	1.9	1.9	E	5.4	3	6								
	IC-6	10.6	E	5.0												1=B 2=C 3=E

		Receive Pin No.														
Unit	No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Notes
U-116 PLL	IC-7	5	-9.3													1=Output 2=Input
,,	IC-8	13.8	0	8.4												1=B 2=C 3=E
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
		5	1.5	0.8	1.4	5	0	0	0	0	0	0	0	0	0	
U-116 PLL	IC-1	15	16	17	18	19	20	21	22	23	24	25	26	27	28	21~28
		0	0	0	0	0~5	0	0~5	0~5	0~5	0~5	0~5	0~5	0~5	0~5	D.LSW.ON-5V T.S SW.ON-0
		29	30	31	32	33	34	35	36	37	38	39	40			
		0~5	0~5	0~5	0~5	0~5	0	5	0	0	0	0	2.8			29~33 D.L SW ON-5V

SECTION XI BLOCK DIAGRAMS




PLL
Modulator IS2688C
10.7MHz OSC 2SC945
Buffer Amp BA401
Transmit Mixer TA7045
Filter LS-73x6
Buffer Amp 3SK40
Pre Drive Amp 2SC2053
Drive Amp 2SC1947
Final Amp 2SC2094
Antenna Switch 1SS55x2 2SA639
Harmonic Filter
ANT
Splatter Filter 2SC1571
SSB MOD
SSB/FM Gene SW 1SS53x2
LO Switch 1SS53x2
ALC Control JA1050
ALC Control 2SK44
ALC Detector 1SS53x2
APC Control JA1050
APC Amp 2SC945
Directional Coupler LR-13 IN60x2
SSB IF/Gene
SSB T/R SW 1SS53x2
S & RF METER
SSB S METER
Low
Hi
SSB AGC
I.D.C. 2SC1571 2SC945x2
SSB/FM IF SW 1SS53x2
CM Filter 10M20A
1st Mixer 3SK40
Filter
RF Amp 3SK40
Signal Detector IN60
MIC
Mic Amp 2SC1571 JA1050
Xtal OSC 2SC945
2nd Mixer 2SK49
Filter CFU455Ex2
IF Amp 2SC945
IF Amp 2SC945
IF Amp 2SC945
Limiter uPC577
Discri 455D
Noise Amp 2SC945
19V
R9V
9V
Transmit 9V Reg 2SD359
Transmit Switch 2SC945
Receive 9V Reg JA1600
9 Volt Regulator JA1600
AF Pre Amp 2SC1571
Squelch Control 2SC945
Noise Detector IN60x2
Noise Amp 2SC945
P.T.T. SW
Photo Sensor MDY54C
Switch JA1600 2SC945x3
LED Display
Referense Voltage XZ096
Signal Indicate SEL1035
LED Switch 2SC945
AF Filter 2SC1571
AF Amp uPC575C
SPK
SSB AF
Transmit Indicate SEL103S
Reverse Protect SRION-2R
PS 13.8V



INOUE COMMUNICATION EQUIPMENT CORPORATION

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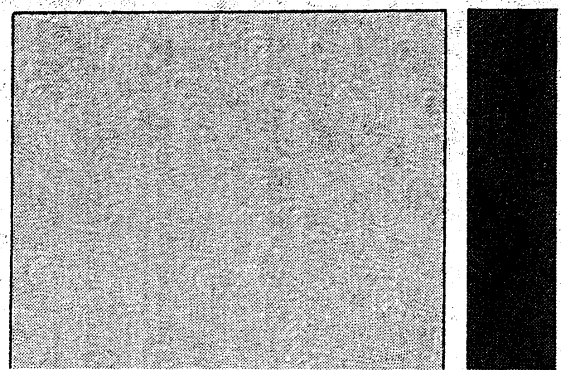
OSAKA JAPAN



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