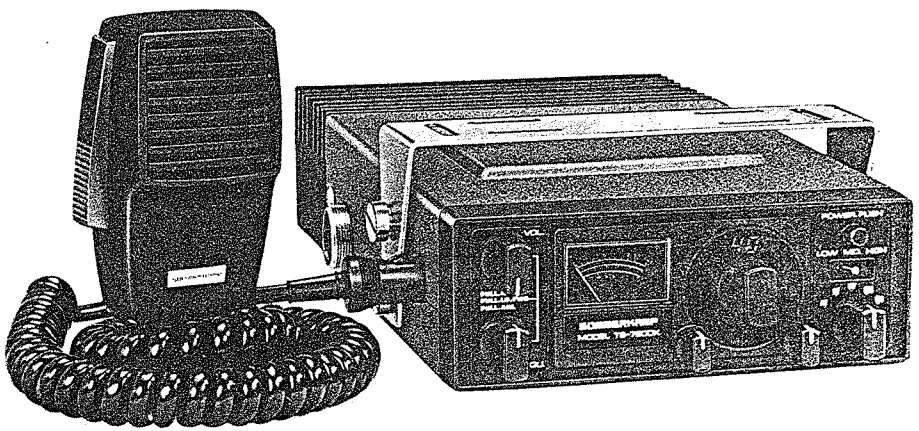
SOMMERKAMP

AM/FM/LSB/USB/CW TRANSCEIVER

INSTRUCTION MANUAL



MODEL: TS-780DX

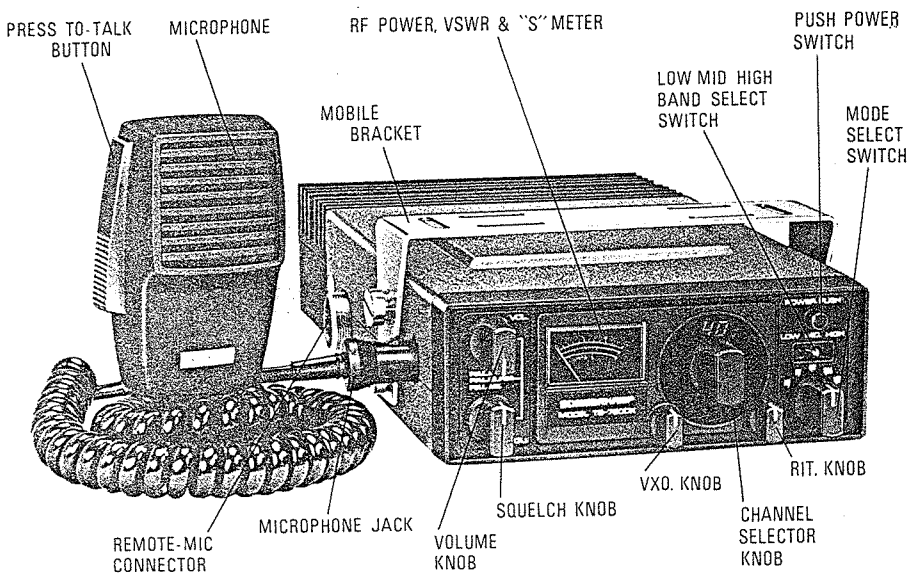
SOMMERKAMP ELECTRONIC SAS

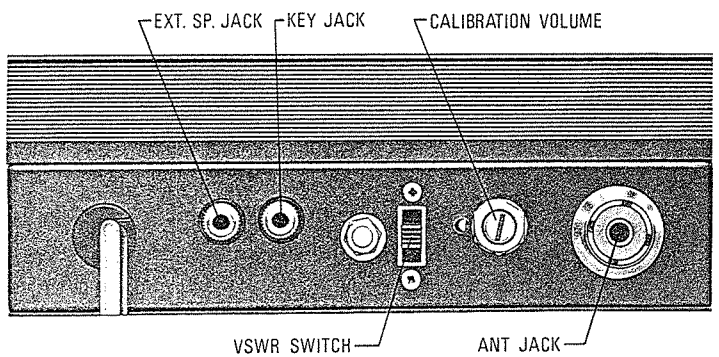
CH-6903 LUGANO, P.O. BOX 176

SWITZERLAND

TEL. 91 688543 TELEX: 79314

CONTROL LOCATIONS:





PACKING LIST:

Beside this manual, the carton shall contain the following items:

1. Transceiver TS-780DX
2. Mounting bracket
3. Screws for mounting
4. Microphone
5. Microphone hanger
6. Shortening plug

GENERAL DESCRIPTION

Your SOMMERKAMP TS-780DX transceiver has been designed for continuous heavy duty mobile and base station application on AM, FM, LSB (Lower Single Sideband), USB (Upper Single Sideband) or CW (Morse Key).

It can be operated with a microphone and internal speaker or handset, speaker/microphone combination, telephoneset incorporating automatic voice operated transmit/receive switching, external selective calling with automatic answer-back. One more special feature of your TS-780DX is that you can operate this transceiver also with an additional external remote micropnone by which you can control channel selection, volume, ~~squelch~~ VXO and observe at the same time digital LED channel indication and S/RF meter.

The transceiver is designed to operate with a 13.8V DC power supply as a base station or mobile station. Its straight forward 120 channel capability allows it to operate on any channel within ~~26.965~~ 26.325 and ~~28.945~~ 27.885 MHz.

RECEIVER SECTION

The receiver section is designed to receive either AM/A3, FM/F3, SSB/A3J and CW/A1 signals in the ~~26.965~~ 26.325 to ~~28.945~~ 27.885 MHz band.

The unique combination of low noise Field Effect Transistors (FET), a combination of ceramic filters, L/C filters and crystal filter, efficient noise limiter (ANL) and a HIFI quality speaker amplifier will give you exceptional reception quality.

In addition, the above combination of the latest technology provides you with a sensitivity and unwanted singal rejection and noise suppression available previously only in space and military communication equipment. Power supply of the receiver RF, IF and oscillator section is stabilized by an extreme sharp cut-off Zener diode to obtain the high sensitivity and unwanted signal rejection.

The efficient series gate noise limiter, which virtually cuts off the audio output during ignition noise pulses, is defeatable to make even the weakest signal audible which otherwise would be cut off by the threshold level of the ANL switching diode.

The high squelch sensitivity is achieved by using a separate squelch detector and switching circuit with a carefully balanced hysteresis.

The transformerless HIFI quality audio amplifier will drive any load between 8 ohms and indefinite such as internal speaker or external speaker/microphone or headset combinations having the above impedances.

Thanks to the delta tune and VXO control, the reception coverage on all entire frequencies is possible.

TRANSMITTER & MODULATOR SECTION

The transmitter section is designed for continuous heavy duty transmission of either AM/A3, FM/F3, SSB/A3J and CW/A1 signals in the 26.325 to 27.855MHz band.

The transmitter consists of a Phase-Locked-Loop circuit and 2 sets of one crystal controlled oscillator, of which output is synthesized in a balance mixer followed by a double tuned filter, class AB1 buffers, autotune circuit and power output stage, coupled by series and pi-matching filters to the antenna jack.

Modulator is consisted of an input audio filter, ALC amplifier and audio buffer followed by balance modulator for AM and SSB, or VCO for FM. The input is designed for 500 ohm dynamic microphone or 32 ohm speaker/microphone combination with a 1K ohm resistor in series.

FEATURES AND CONTROLS

VOLUME/NOISE BLANKER

The receiver volume will increase as it is turned clockwise.

To pull it, the Noise Blanker circuit will be opened and all the incoming noises shall be cut off to the maximum extent.

SQUELCH/ANL-OFF

The squelch control is used to eliminate the background noise when there are no signals present strong enough to overcome the noise. To adjust the squelch control, select a channel where there is no signal. Turn the volume up to normal listening levels. Rotate the squelch control clockwise until the background noise just disappears.

The ANL (Automatic Noise Limiter) circuit will be on when this knob is pulled.

CHANNEL SELECTOR

This is an electronic channel selector. By first rotation it counts only a single channel and by second full position it counts continuous successive channels. By right rotation it increases channel and by left rotation it decreases channel.

CHANNEL MEMORY

A useful feature of this transceiver is the channel memory. The channel you used last is memorized even after you switch off the unit and will be indicated again on the digital channel indicator when you turn on the transceiver.

MODE SWITCH

You can select either AM, FM, LSB, USB or CW.

BAND SWITCH

LOW·····26.325 - 26.765 MHz
MID·····26.965 - 27.405 MHz
HIGH····· 27.415 - 27.855 MHz

POWER ON-OFF SWITCH

You can turn the transceiver on by pushing this switch and turn it off by pushing it again.

DELTA TUNE (RIT)

The delta tune is an electronic tuning circuit which allows you to shift the frequency of the transceiver. In SSB operation, even small differences in frequencies between stations can cause poor reception. In effect, the delta tune electronically fine tunes the stations being received.

In AM operation, this acts as a fine tuning circuit.

VXO (Variable Crystal Oscillator)

By rotating this control, you can shift the frequency both on TX and RX by max. ±5.5KHz. This can be used for communication between channels.

Thus it makes you possible to cover the entire successive frequencies.

S/RF-CAL-SWR METER FUNCTION SWITCH AND CALIBRATION

In the bottom position of the 3-position slide switch found on the rear pannel, the meter operates normally as S-meter and RF output meter. In the center and top position of this switch, the SWR (Standing Wave Ratio) functions are achieved.

To measure the SWR, select an open or little used channel as close as possible to the center of the range of channels you plan to operate on. If you plan to operate on all channels 1 through 40, you should select a channel between 17 and 23.

1. Set the switch to CALIB (Calibrate).
2. Press the microphone push-to-talk bar and adjust the SWR control potentiometer on the rear pannel so the meter needle is at the maximum position. And release the press-to-talk bar of the microphone.
3. Set the switch to SWR to the top position.
4. Press the press-to-talk bar of the microphone again and read the SWR measurement on the bottom scale.
5. Then switch it to S/RF to the bottom position of the slide switch for normal operation.

The SWR scale is calibrated at 1, 1.5, 2 and 3. If the meter pointer stops at 2 for instance, it would be correct to say that the SWR is 2 to 1.

It is recommended that the SWR does not exceed 1.5 to 1 or at maximum 2 to 1.

CW OPERATION

For operating a Morse key device, connect a plug into the CW key jack provided on the rear pannel of the transceiver, and set the mode switch to CW position. For tuning to an incoming CW signal, adjust the VXO Control so that you can hear the tone frequency in the vicinity of 700Hz. Always press the talk bar on the microphone during cw transmission.

S/RF METER

This transceiver is equipped with a large, easy-to-read combination meter. In the receive position, it reads the level of the incoming signals, and in the transmit position it indicates relative power output.

NOTE: 1. In the AM mode, the meter will read power at all times when the transmit button is depressed. On SSB, however, it will only indicate RF output power when you modulate the signal.

2. In the SSB mode, no meter can follow the rapid voice peak power attained. Therefore, while the transmitter is developing much more power than on AM, the additional power will not be full reflected on the meter.

EXTERNAL SPEAKER JACK

You may add any 8-16 ohm external speaker. Connecting an external speaker will automatically disconnect the internal speaker.

ANTENNA CONNECTOR

A standard SO-239 type connector is applied for attaching either mobile or base antenna.

26-PIN ACCESSORY JACK

This jack is for additional remote control microphone with the following functions: (This microphone is optional)

1. LED digital channel readout.
2. Up-Down channel selector.
3. Volume control.
4. VXO control.
5. Automatic scanner.
6. Meter.

When you use this microphone, always have the normal microphone or the shortening plug inserted into the microphone jack.

MICROPHONE

To transmit simply press the press-to-talk bar of the microphone and release it for receiving. The microphone has the auxiliary volume control which is an extension of the regular front pannel receiver volume control. It offers great operating convenience by giving you instant volume adjustment right at your fingertips while you are driving. As this is an extension control, the regular front pannel volume control should be advanced in order.

LOW/HIGH OUTPUT POWER SWITCH

Another additional feature of this transceiver is a possibility of changing the output power.

Pull both Volume and Squelch controls·····Low Power (about 10W PEP)

One of the above controls is pushed or pulled···High Power (about 100W PEP)

NEGATIVE GROUNDING

Almost all cars and most trucks are negative grounded. Your TS-780DX is also designed to operate on the negative ground only. In the negative ground systems, the minus (−) pole of the transceiver should be connected to the car body or chassis.

NOTE: Many newer cars use plastic dash pieces. Make sure the screws or contacts you choose are attached to the metal framework of the car.

MOBILE INSTALLATION

Mounting bracket and screws are supplied with the transceiver. For electrical connection, first make sure the transceiver is turned off. Then connect the red wire to the ACC terminal of the ignition switch or plus (+) terminal of battery and ground the black wire to the car body or chassis. The black wire should be grounded as short as possible to minimize noise interference.

BASE STATION OPERATION

For base station use, a suitable regulated 15 Amp power supply is recommended. When a power supply is used, simply connect the red (+) and black (−) terminals on the power supply of the (+) and (−) leads on your transceiver.

GENERAL OPERATING INSTRUCTIONS

Never operate this transceiver without an adequate antenna system or load. Antenna SWR should not exceed 2: 1. Failure to follow these recommendations could result in damage to the output transistors.

1. Make sure the proper connections are made for antenna system, power cable and microphone.
2. Set the squelch control fully counter-clockwise.
3. Set the Mode Switch to the desired mode.
4. Push the Power On-Off Switch, and the meter and the channel readout shall be lighted.
5. Rotate the Volume Control clockwise to the desired listening level.
6. With no signal present, rotate the Squelch Control clockwise until the rushing noise just disappears.
7. Set the Channel Selector to the desired channel.
8. To transmit, simply press and hold the press-to-talk bar on the microphone and speak in a normal tone of voice.
9. Set the Delta Tune for best reception.

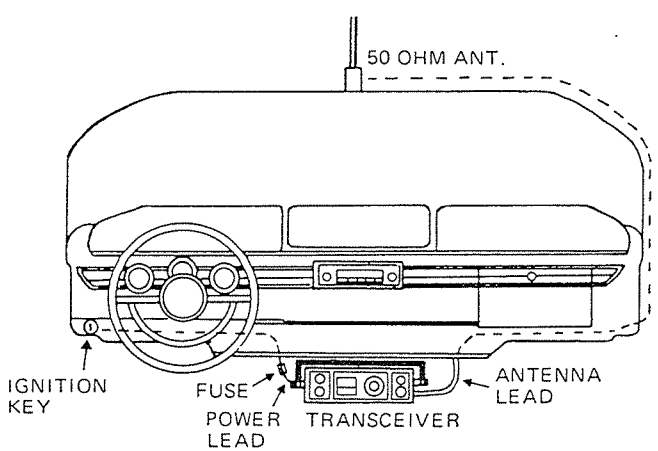
ANTENNA REQUIREMENT

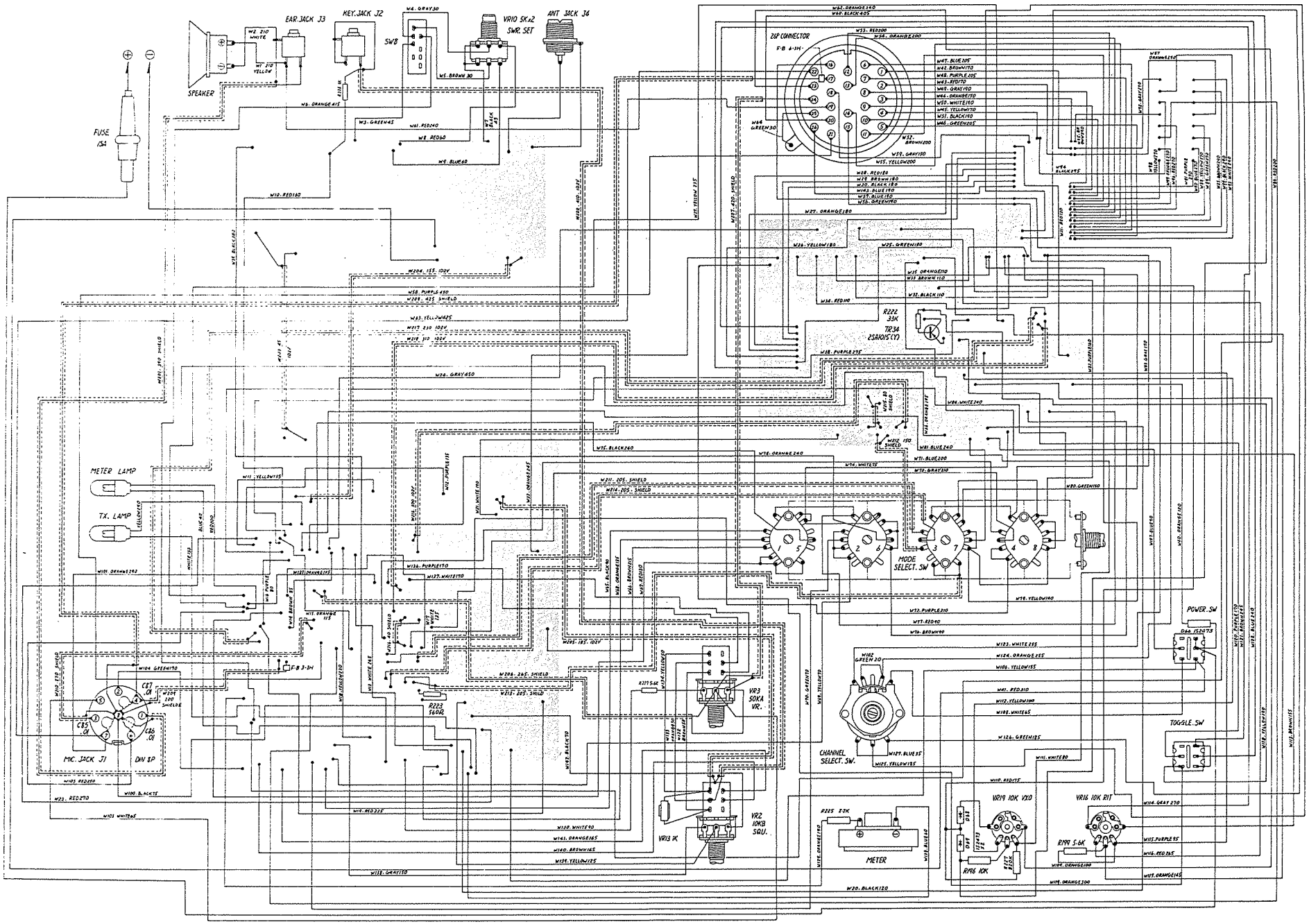
This transceiver will operate with any standard 50 ohm ground-plane, vertical, mobile whip, long wire or other adequate antennas. A standard SO-239 type connector is provided on the back pannel for use with popular PL-259 antenna plug.

A ground-plane type will provide greater coverage, and since it is essentially non-directional, it is ideal in base station to mobile operation. From base station to base station, or point to point operation, a directional beam will give greater distance even under the adverse conditions.

A vertical whip antenna is best suited for mobile use. A non-directional antenna must be used for best result in any case. The base loaded whip antenna will normally provide effective communication.

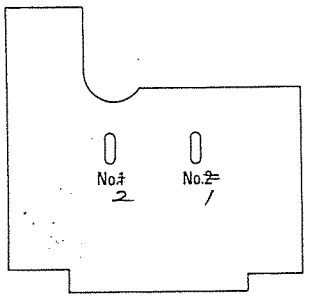
For greater range and more reliable operation, a full quater wave whip may be used. Either of these antennas use the metal car body as a ground-plane, and the shield of the base lead as well as the metal case of the transceiver should be grounded.




SPEAKER
EAR JACK J3
KEY JACK J2
SW8
VR10 5K×2
SWR. SET
ANT JACK J6
FUSE
1A
28P CONNECTOR
F/B 6-1H
R202
33K
TR34
2SA1015(Y)
METER LAMP
TX. LAMP
MODE
SELECT. SW
POWER. SW
TOGGLE. SW
CHANNEL
SELECT. SW.
VR3
50KA
VR.
VR2
10KB
SQU.
VR13 1K
R225 2.7K
METER
VR19 10K VOX
VR16 10K MIT
R199 5.6K
R196 10K
MIC. JACK J1
DIN 8P
C87
.01
C85
.01
C86
.01
F/B 3-1H

CHANGING FREQUENCIES

You can change the frequencies for each band by exchanging the crystals as shown below:

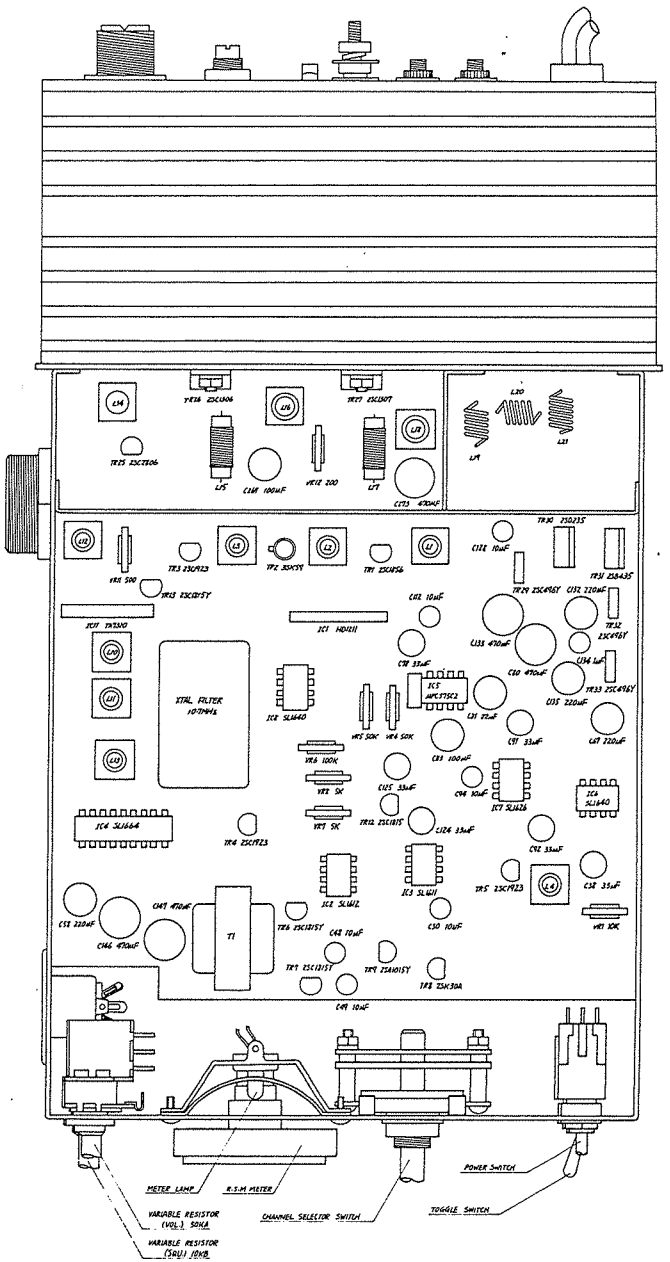


No. 1 crystal is for LOW & MID band and No. 2 for HI band. Those crystals are plug-in type which you can easily exchange.
Crystal Freq. = Starting Freq. of the band - 11.98MHz.
The crystals installed are good for the following frequencies:
LOW ····· 26.325 - 26.765MHz.
MID ····· 26.965 - 27.405MHz. (This band is automatically synthesized by the
HIGH ····· 27.415 - 27.855MHz. difference of 640KHz from the LOW band)
Therefore No. 1 crystal: Fc = 26.325 − 11.98 = 14.345MHz.
No. 2 crystal: Fc = 27.415 − 11.98 = 15.435MHz.

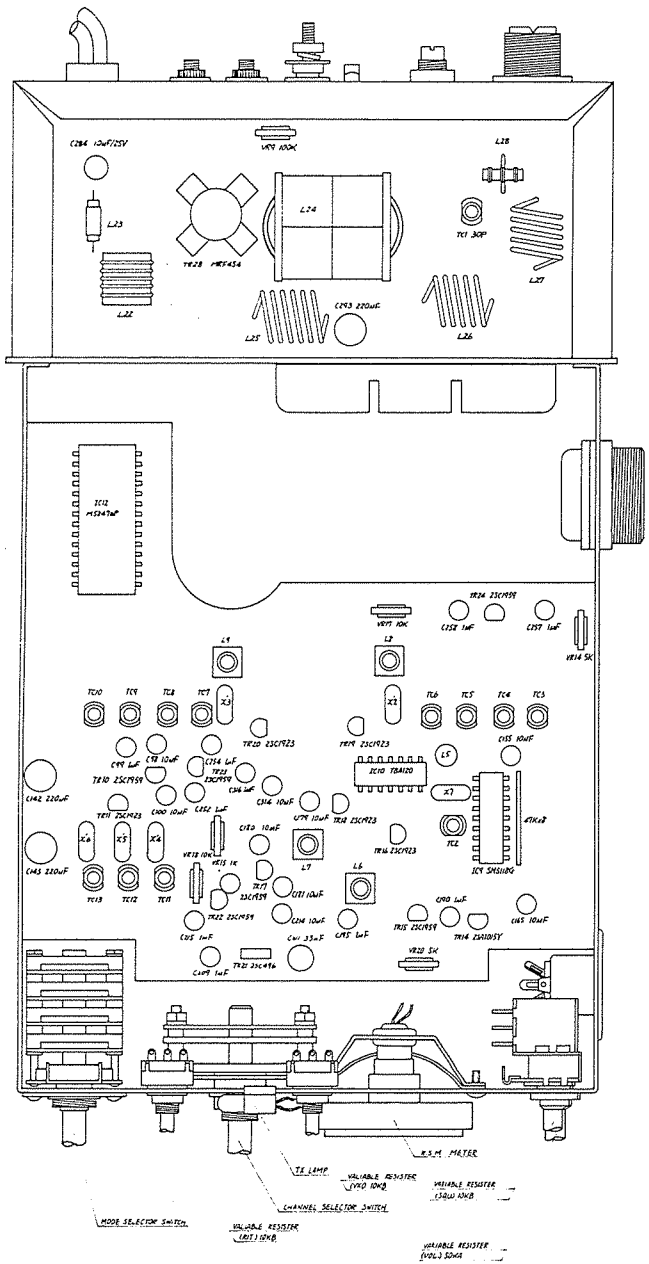
TS-780DX LIST OF CHANNEL FREQUENCY

CH.	LOW. CH.	MID. CH.	HIGH.CH. (MHz)	CH.	LOW. CH.	MID. CH.	HIGH.CH. (MHz)
1	26.325	26.965	27.415	21	26.575	27.215	27.665
2	26.335	26.975	27.425	22	26.585	27.225	27.675
3	26.345	26.985	27.435	23	26.615	27.255	27.705
4	26.365	27.005	27.455	24	26.595	27.235	27.685
5	26.375	27.015	27.465	25	26.605	27.245	27.695
6	26.385	27.025	27.475	26	26.625	27.265	27.715
7	26.395	27.035	27.485	27	26.635	27.275	27.725
8	26.415	27.055	27.505	28	26.645	27.285	27.735
9	26.425	27.065	27.515	29	26.655	27.295	27.745
10	26.435	27.075	27.525	30	26.665	27.305	27.755
11	26.445	27.085	27.535	31	26.675	27.315	27.765
12	26.465	27.105	27.555	32	26.685	27.325	27.775
13	26.475	27.115	27.565	33	26.695	27.335	27.785
14	26.485	27.125	27.575	34	26.705	27.345	27.795
15	26.495	27.135	27.585	35	26.715	27.355	27.805
16	26.515	27.155	27.605	36	26.725	27.365	27.815
17	26.525	27.165	27.615	37	26.735	27.375	27.825
18	26.535	27.175	27.625	38	26.745	27.385	27.835
19	26.545	27.185	27.635	39	26.755	27.395	27.845
20	26.565	27.205	27.655	40	26.765	27.405	27.855

COMPLETE PARTS LAYOUT



COMPLETE PARTS LAYOUT



PARTS LIST for TS-780DX

DESIGNATION	PARTS NAME	PARTS NO.
IC1	Integrated circuit	HD-1211
IC2	Integrated circuit	SL-1612
IC3	Integrated circuit	SL-1611
IC4	Integrated circuit	SL-1664
IC5	Integrated circuit	μPC575C2
IC6, 8	Integrated circuit	SL-1640
IC7	Integrated circuit	SL-1626
IC9	Integrated circuit	SM5118G
IC10	Integrated circuit	TBA120
IC11	Integrated circuit	TA7310
IC12	Integrated circuit	M58476
TR1	Transistor	2SC1856
TR2	FET	3SK59
TR3, 4, 5, 11, 16, 18, 19, 20	Transistor	2SC1923-0
TR6, 7, 12, 13	Transistor	2SC1815-Y
TR8	FET	2SK30-A
TR9, 14, 34	Transistor	2SA1015-Y
TR10, 15, 17, 22, 23, 24	Transistor	2SC1959-Y
TR21, 29, 32, 33	Transistor	2SC496-Y
TR25	Transistor	2SC2086
TR26	Transistor	2SC1306
TR27	Transistor	2SC1307
TR28	Transistor	MRF454
TR30	Transistor	2SD235-0
TR31	Transistor	2SB435
D1～4 D6～D11 D20～D26 D36～D43 D46～D56 D66	Silicon Diode	1S2473
D5, 64, 65	Germanium Diode	1N60
D12, 59	Zener Diode	WZ-060
D13, 32	Zener Diode	WZ-090
D14, 16, 18, 61, 62, 63	Silicon Diode	1N4002
D15, 17, 19, 27, 30, 58, 60	Zener Diode	WZ-070
D29	Zener Diode	WZ-050
D31	Varicap Diode	1S2689

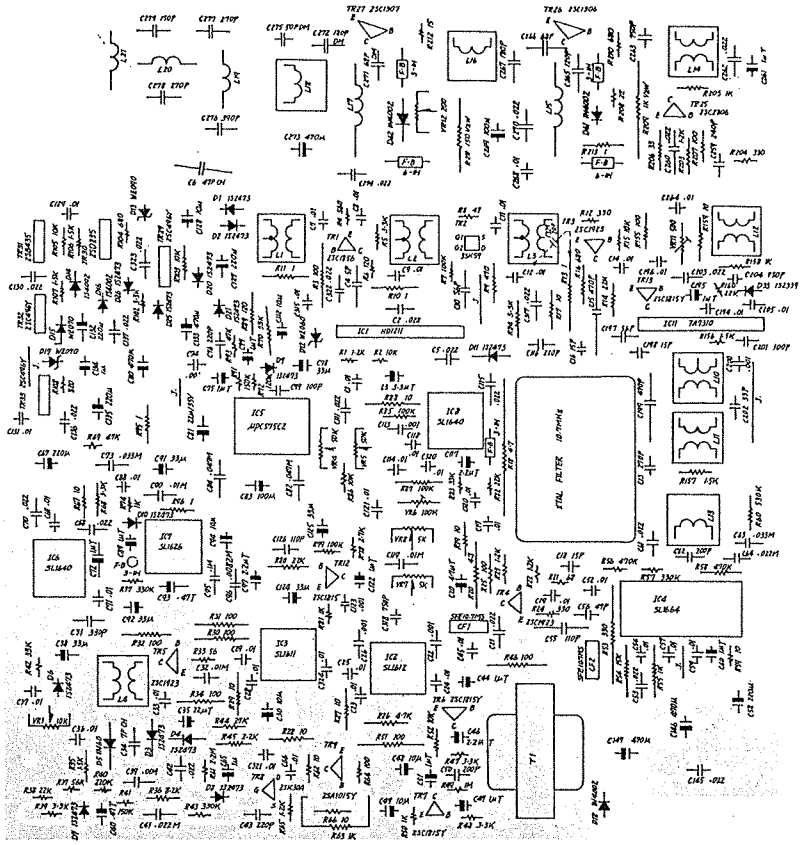
PARTS LIST for TS-780DX

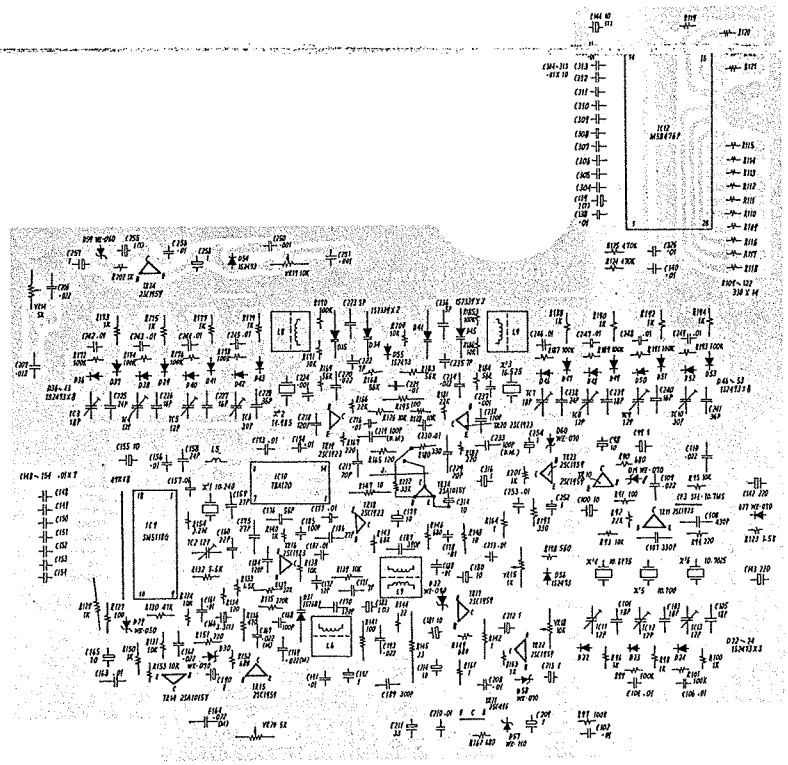
DESIGNATION	PARTS NAME	PARTS NO.
D33, 34, 35, 44, 45	Varicap Diode	1S2339
D57	Zener Diode	WZ-110
R. S. M	Meter	S510C119
MIC	Microphone Complete	22-350-08
S. P	Speaker	74EP02-1
JI	DIN JACK	
J2	Ext Key JACK	SJ-296
J3	Ext. Earphone JACK	SJ-296
J4	Antenna JACK	MRM/INCH
J5	26P Remote Mic Connector	19R26B
XF1	X'tal Filter	10F-40D 10.7MHz
CF. 1, 2, 3	Ceramic Filter	SFE 10.7MS
LED	LED Display	GL-7N202
T1	Power Choke Transformer	E1-24
SW1	Toggle Switch	8A-2021
SW2	Power Switch	MS-251-6P
SW3	Channel Selector Switch	S32BP (24) 1-2-5W
SW8	Slide Switch	SS (H) -23-05
SW9	Rotary Switch	ESR-E4S5K25W
L1	RX RF Tuning Coil	361-004
L2	RX RF Output Coil	361-008
L3, 4	RX Mixing/RX AM Det. Coil	361-006
L5	PLL. Mixing Filter Coil	269-602
L6	VCO Coil	361-001
L7	VCO. Buffer Coil	361-002
L8, 9	VXO Coil	361-003
L10, 11	TX Mixing Coil	361-007
L12, 14	TX Mixing Output/TX Buffer Coil	361-009
L15, 17	TX PRI. Drive/Tx Drive RFC	010-907
L18	TX Drive Coil	361-801
L19, 20, 21	L. P. F Coil	152-903
L13	RX FM Det. Coil	361-005
L22, 24	TX Power Input/Tx Power Output Coil	OP13-12.5-8H

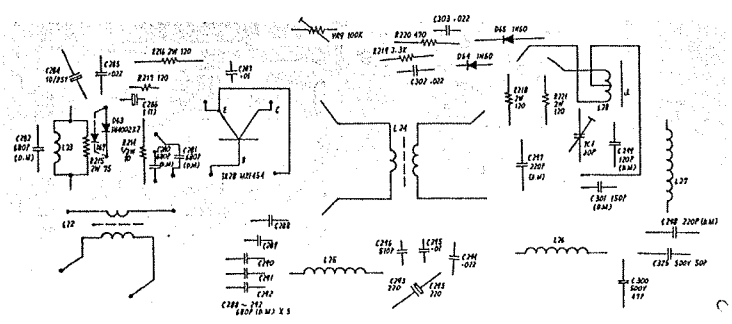
PARTS LIST for TS-780DX

DESIGNATION	PARTS NAME	PARTS NO.
L23	Tx RF Choke Coil	005-903
L25	Tx RF Choke Coil	089-916
L26, 27	Tx L. P. F Coil	361-901
L16	Tx PRI. Drive Coil	005-907
L28	VSWR. Pick up Coil	280-702
F. B	Ferrite Beads	T314, OP-3.5-6-IH
F. B	Ferrite Beads	T314, OP-3.5-3-IH
TC1. 6. 10	Trimmer 30PF	CV05E300
TC2, 4, 5, 8, 9, 11, 12, 13	Trimmer 12PF	CV05C120
TC3, 7	Trimmer 18PF	CV05D180
VR1, 17	Semi Variable Resistor 10K ohm	SVR010KS3
VR2	Variable Resistor (SQU) 10K ohm	VM13E-VER22
VR3	Variable Resistor (VOL) 50K ohm	VM13E-VER22
VR4, 5, 19	Semi Variable Resistor 50K ohm	SVR050KS3
VR6, 9	Semi Variable Resistor 100K ohm	SVR100KS2
VR, 7, 8, 14, 20	Semi Variable Resistor 5K ohm	SVR005S3
VR10	Variable Resister 50K × 2 ohm	GM70A
VR11	Semi Variable Resistor 500 ohm	SVR500S2
VR12	Semi Variable Resistor 200 ohm	SVR200S3
VR13	Semi Variable Resistor 1K ohm	SVR001KS2
VR15	Semi Variable Resistor 1K ohm	SVR001KS3
VR16	Variable Resister (RIT) 10K ohm	V12M4-1S
VR19	Variable Resister (VXO) 10K ohm	V12M4-1S
F1	Fuse 15A	F-15A
TL: ML	Meter/Tx Lamp 14V—80mA	533087
MP-443	Front Frame	524405
MP-533	Front Plate (R)	534573
MP-534	Front Plate (L)	534572
MP-535	Brand Plate	534574
MP-536	Back Plate	534575
MP-537	Chassis Frame	532095
MP-107	Mounting Bracket	484085
MP-538	Cabinet Cover (Upper)	533077

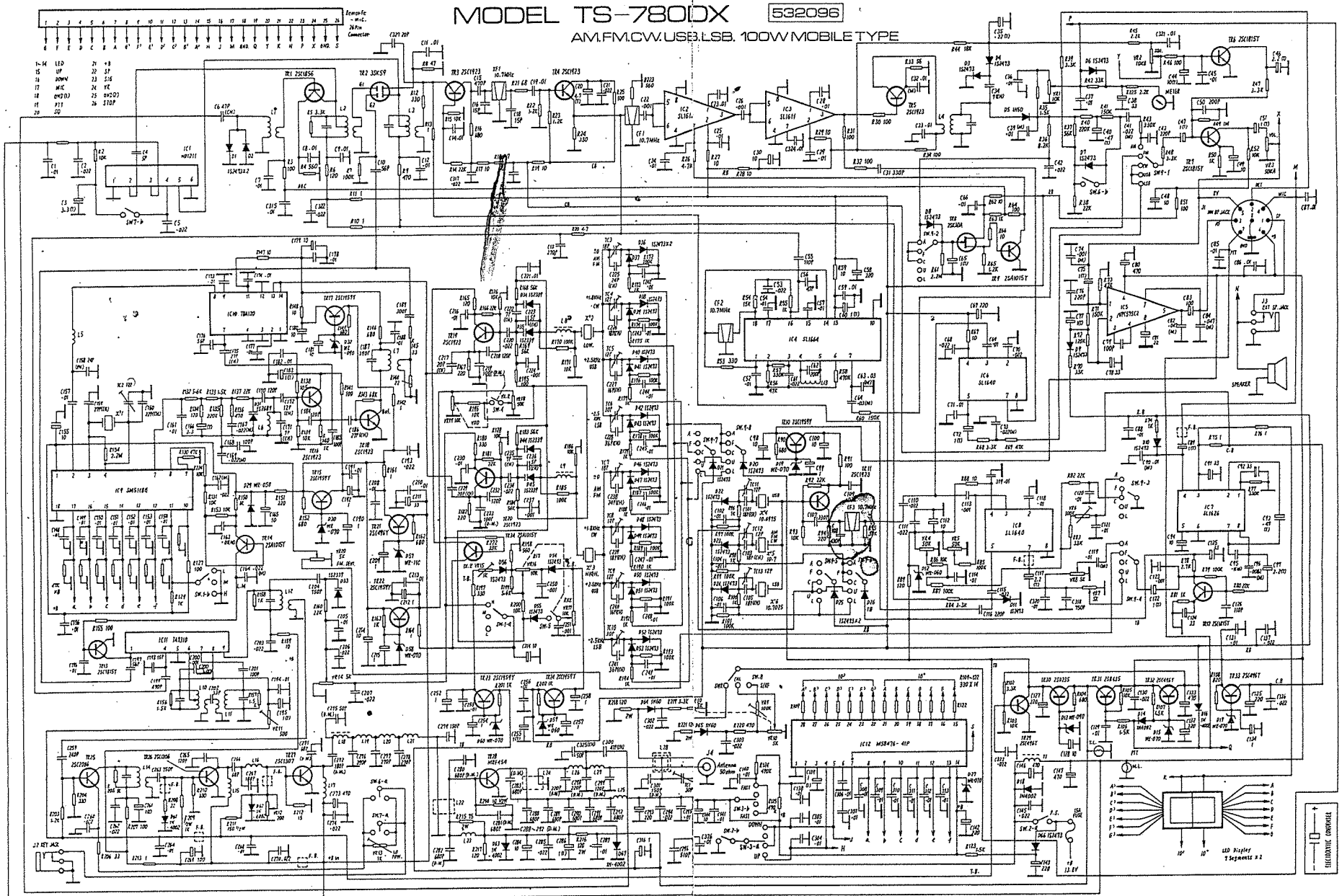
PRINTED CIRCUIT BOARD PARTS LAYOUT







CIRCUIT DIAGRAM



PARTS LIST for TS-780DX

DESIGNATION	PARTS NAME	PARTS NO.
MP-539	Cabinet Cover (Lower)	533078
MP-540	Back Pannel	534560
MP-211	Meter Lamp Reflection Plate	484063
MP-541	Heatsink	534557
MP-542	Booster Chassis	534558
MP-462	Booster Chassis Cover	524421
MP-353	Heatsink (A)	494251
MP-543	Mode SW Mounting Plate	534561
MP-117	Knob for Channel Selector	484116
MP-17	Knob for vol./Squ./Mode Control	474011
MP-307	Knob for VOX./RIT. Control	494199
MP-544	Shild Case	533076
MP-545	Shild Case Cover	534559
MP-546	Shild Plate	533073
MP-5	Mounting Bracket for Speaker	474038
MP-547	Mounting Bracket for Speaker	534570
MP-110	Mounting Bracket for. Meter	484064
MP-452	Shild Plate C.D	524430
MP-120	Screw for Mounting Bracket	484098
MP-548	Microphone Hanger	484056
MP-549	Lamp Holder	484088
MP-550	Spacer	534517
MP-118	Nut for Channel Selector	484073
MP-551	Spacer for Booster	534564
MP-552	Brass Bobbin	534566
MP-553	Acrylic Resin Plate	534513
MP-554	Knob for Power SW.	534562
MP-555	Spacer for Power SW.	534563

SPECIFICATIONS

GENERAL:

1. Semiconductors : 12 IC's, 32 Transistors, 2 FET's & 66 Diodes.
2. Frequency Range : LOW Band 26.325 - 26.765 MHz.
   Mid Band 26.965 - 27.405 MHz.
   High Band 27.415 - 27.855 MHz.
3. Modes of Operation : AM, FM, LSB, USB & CW
4. Speaker : Dynamic type, 8 ohm.
5. Microphone : Dynamic type, 500 ohm.
6. Power Supply : 11V—16V DC, negative ground.
7. Antenna Impedance : 50 ohm.
8. Size : 61×156×290mm

RECEIVER:

1. Receiver System : Single Conversion PLL Superheterodyne.
2. Sensitivity at S/N 10dB : AM ·····0.75μV
   FM ·····0.75μV
   SSB·····0.25μV
3. Selectivity : AM ·····4KHz at Bandwidth-6dB.
   FM ·····4KHz 60db down at 7 KHz
   SSB·····4KHz
4. AGC Figure of Range : 100dB.
5. Squelch Range : 1μV—100μV.
6. Audio Output Power : 2.5 Watts
7. Spurious Response : —60dB.
8. I.F. : 10.7MHz.

AM TRANSMITTER:

1. RF Output Power : 100 watts PEP (25 watts carrier)
2. Modulation Capability : More than 80%
3. Harmonic Suppression : More than 50dB.

FM TRANSMITTER:

1. RF Output Power : 100 Watts
2. Deviation : ±2KHz.
3. Harmonic Suppression : More than 60dB.

SSB TRANSMITTER:

1. RF Output Power : 100 Watts PEP.
2. Carrier Suppression : More than 50dB.
3. Unwated Sideband Suppression : More than 60dB.
4. Harmonic Suppression : More than 60dB.