



**RadioShack®**

## **DSP-40 NOISE REDUCTION SYSTEM**



### **Owner's manual**

Part #210-0543

The Radio Shack DSP Communication Noise Reduction System is a computer controlled digital signal processor with a built-in audio amplifier and speaker. It is designed for use with all communication receivers including ham, short wave, HF marine, and CB radios. The DSP (Digital Signal Processing) circuit dramatically reduces heterodynes (annoying tones) and reduces background noise from incoming signals.

The system includes these features:

- Selectable Low-Pass DSP NR (Noise Reduction) Filters - Reject heterodynes and reduce back ground channel noise from communications receivers.
- 5-Watt Audio Amplifier - For plenty of audio output.
- External Speaker Jack - Lets you connect an external speaker with a 1/8-inch plug to the DSP to enhance sound.
- Morse Code (CW) Filters - Allows clean reception of Morse code signals.
- SSB Bandpass Filters - Help allow clean reception of SSB (single side-band) signals.
- DSP Indicator - Shows you the optimum input audio level.
- Output Volume/ Power-On Control - Lets you adjust the volume after you turn on the system.
- Power On Indicator - Shows you when the system is on.
- Mounting Bracket - Lets you mount the system in your vehicle.
- Note: You can power the system from a 12-volt DC power cord source with the supplied power cord or from a standard AC outlet with an optional adapter.

## MOUNTING THE SYSTEM

Follow these steps to mount the system in your vehicle.

1. Choose a location for the mounting bracket. Be sure you mount the system close enough to allow convenient operation while you drive your vehicle.
2. Using the mounting bracket as a template, draw two oval marks on the mounting surface.
3. Drill holes  $7/32$ -inch in diameter within each mark, being careful not to drill into object behind the mounting surface.
4. Place the mounting bracket over the holes with the open slots facing away from you. Secure the bracket using the supplied bolts, spring washers, plain washers, and nuts.

Notes:

If you cannot reach behind the mounting surface to attach the nuts on the bolts, use the supplied self-tapping screws, plain washers, and spring washers to secure the bracket.

If you use the supplied self-tapping screws, drill holes  $5/32$ -inch in diameter in Step 3.

5. Position the system inside the bracket. Then slide the mounting tabs on the bottom of the system into the slots on the bracket until the system locks into place.

To release the system from the bracket, press the lock tabs and slide the system away from the bracket slots.

## SELECTING THE FILTER

Set FILTER to the type of filter needed for your system.

Select NR to reduce static or hiss from audio signals.

Select SSB to reject adjacent signals that might be higher or lower in tone and tune your receiver for the best SSB audio quality.

Select CW to block out noise above and below the desired tone when you receive Morse code signals. Tune your receiver to match the DSP's passband and maximize audio output.

## SELECTING THE BANDWIDTH

Set BANDWIDTH to select a narrow, medium, or wide bandwidth for the receiving filter. Begin with the wide setting, then adjust towards the narrow setting until undesired sounds are reduced.

## USING THE SYSTEM

1. Turn on the system by turning VOLUME clockwise until you hear it click. The red POWER indicator lights.
2. Locate the desired signal.
3. Press DSP in.
4. Increase the input signal, with your receiver's volume control, until the green DSP indicator flickers when the system receives an incoming signal.

### Notes:

The DSP indicator reflects the input level only when you select the NR or SSB filter. If the indicator lights steadily when there is an incoming audio signal, the signal is too high and might cause excessive distortion. If this happens, readjust the input signal by reducing the receiver's volume.

When you select CW, the DSP indicator lights steadily whether or not it receives an incoming signal.

5. Adjust VOLUME to a comfortable listening level.

## CONNECTING THE SYSTEM TO POWER

You can power the system from a 12-volt DC, negative ground power source.

### For Mobile Use

Follow these steps to connect the system to power in an automobile, boat, or other vehicle.

1. Connect the supplied power cord's red (positive) lead to a terminal inside the vehicle's fuse box that has power when you turn the ignition key to the ACC (accessory) or ON position.
2. Connect the cord's black (negative) lead to ground, such as a bolt attached to the vehicle's chassis.

Note: Do not connect the black lead to a part of the vehicle that is insulated from the chassis by a plastic part. Doing so prevents a proper ground.

3. Connect the supplied power cord's barrel plug to the DC 12V jack on the system's back panel.

### For Home Use

You can power the system from a standard AC outlet. Using AC power requires an adapter (not supplied), such as Cat. No. 22-504.

Caution: You must use an adapter that supplies at least 12 volts and delivers at least 500 milliamps. Its center tip must be set to positive, and its plug must correctly fit the DC 12V jack. The recommended adapter meets these specifications. Using an adapter that does not meet these specifications could seriously damage the system or the adapter.

Follow these steps to use AC power.

1. Insert the adapter's barrel plug into the system's AC 12V jack.
2. Plug the adapter into a standard AC outlet.

## CONNECTING THE AUDIO COMPONENT

To connect the audio component (a CB radio, for example) to the system, plug one end of the supplied audio patch cable into the component's 1/8-inch audio output jack. Then plug the cord's other end into system's AUDIO INPUT jack on the back panel.

## CONNECTING HEADPHONES

To connect headphones (not supplied), plug the headphones' 1/4-inch plug into the headphones jack on the front panel. Your local Radio Shack store sells a variety of headphones, such as Cat. No. 20-210.

### Listening Safety

To protect your hearing, follow these guidelines when you use headphones.

Do not listen at extremely high volume levels. Extended high-volume listening can lead to permanent hearing loss.

Set the volume to the lowest level possible before you begin listening. Put on the headphones, then gradually increase the volume as necessary.

Once you set the volume, do not increase it. Over a period of time, your ears adapt to the volume level, so a volume level that does not cause discomfort might still damage your hearing.

### Traffic Safety

Do not wear headphones while operating a motor vehicle. Even though some headphones are designed to let you hear some outside sounds when listening at normal volume levels, they still present a traffic hazard and are illegal in some areas.

## CONNECTING AN EXTERNAL SPEAKER

To connect an external speaker (not supplied), connect the speaker cable's 1/8-inch plug into the EXT SP jack on the system's back panel. Your local Radio Shack store sells a variety of speaker systems, such as Cat. No. 21-549.

---

# Specifications

---

## Frequency Response

DSP Out Mode ..... 300 to 3000 Hz

## NR Mode

Wide Position Bandwidth ..... 200 to 2950 Hz

Med Position Bandwidth..... 200 to 2500 Hz

Narrow position Bandwidth..... 200 to 2000 Hz

## CW Mode

Wide Position Bandwidth ..... 269 to 1231 Hz

Med Position Bandwidth..... 469 to 1031 Hz

Narrow Position Bandwidth ..... 597 to 903 Hz

## SSB Mode

Wide Position Bandwidth ..... 300 to 3000 Hz

Med Position Bandwidth..... 500 to 2600 Hz

Narrow Position Bandwidth ..... 800 to 2000 Hz

Total Harmonic Distortion ..... 1.0% (Typical)

Signal to Noise Ratio ..... 55 dB (Typical)

Audio Input Level ..... 3.0 Volt Peak - Peak (Max.)

DC 12V Input ..... 11 - 15 VDC, 1.0 A (Max.)

EXT SP (External Speaker Output) ..... 8 Ohms, 8 Watts

Audio Output Power (to EXT SP)..... 6.0 Watts (Typical, 10% THD)

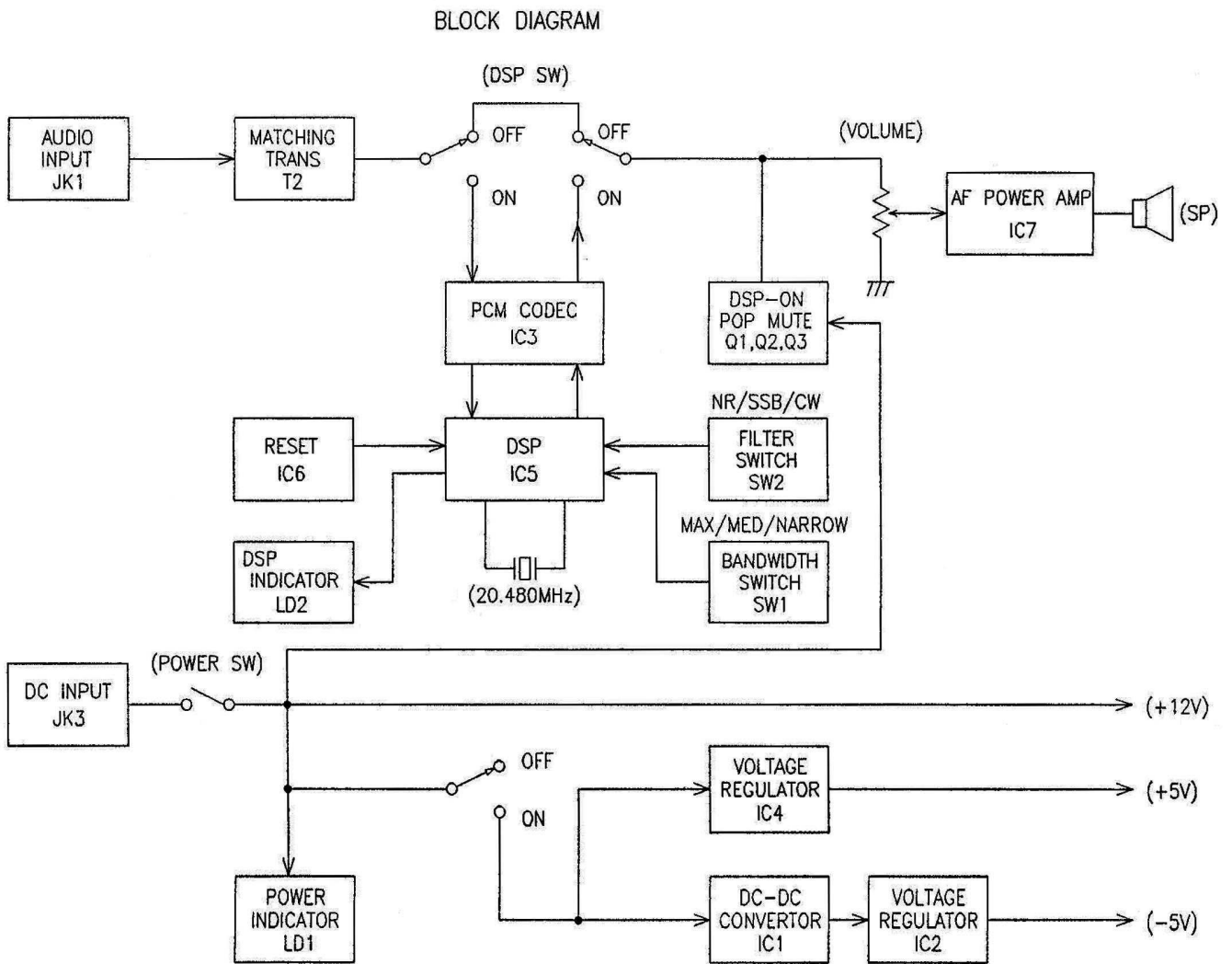
Heterodyne Rejection (SSB/NR Mode) ..... 40 dB (Max.)

Noise Reduction (NR Mode) ..... 20 dB (Typical)

Dimensions..... 1 15/16 x 4 9/16 x 7 1/16 Inches

Weight ..... 1 lb, 4 ounces

# Block Diagrams





---

# Theory of Operation

---

## General

The 21-543 is a DSP noise reduction system with audio power amplifier.

Power is supplied by a 12 volts DC, negative ground power source. Refer to the Block Diagram and the Schematic Diagram as you read the following circuit descriptions.

## Audio Power Amp

Audio input signal is fed to pin 5 of audio power amp. IC (IC7) through matching transformer (T2) and volume control (VR1). The output drives speaker (SP501).

Q1, Q2, and Q3 are to mute pop sound, when DSP switch is turned on.

## DSP Noise Reduction

When DSP switch SW3 is set to the on position, the audio signal is fed to pin 14 of PCM CODEC IC (IC3) through T2 and the output signal is fed to pin 33 of DSP IC (IC5).

The output of IC5 is fed to pin 6 of IC3, then the output is fed to pin 5 of IC7 through VR1.

IC1 and IC2 provide -5 Volts to IC3.

IC4 provides +5 Volts to IC3 and IC5.

IC6 provides power-on reset signal for IC5.

Bandwidth switch (SW1) is the bandwidth selector for WIDE, MED. and NARROW.

Filter switch (SW2) is the filter selector for NR, SSB, and CW.

## Indicators

### Power Indicator (Red)

The Indicator LED (LD1) will light when power switch is turned to the on position.

### DSP Indicator (Green)

The Indicator LED (LD2) will blink when the audio signal level to the audio input jack (JK1) is at a suitable level.

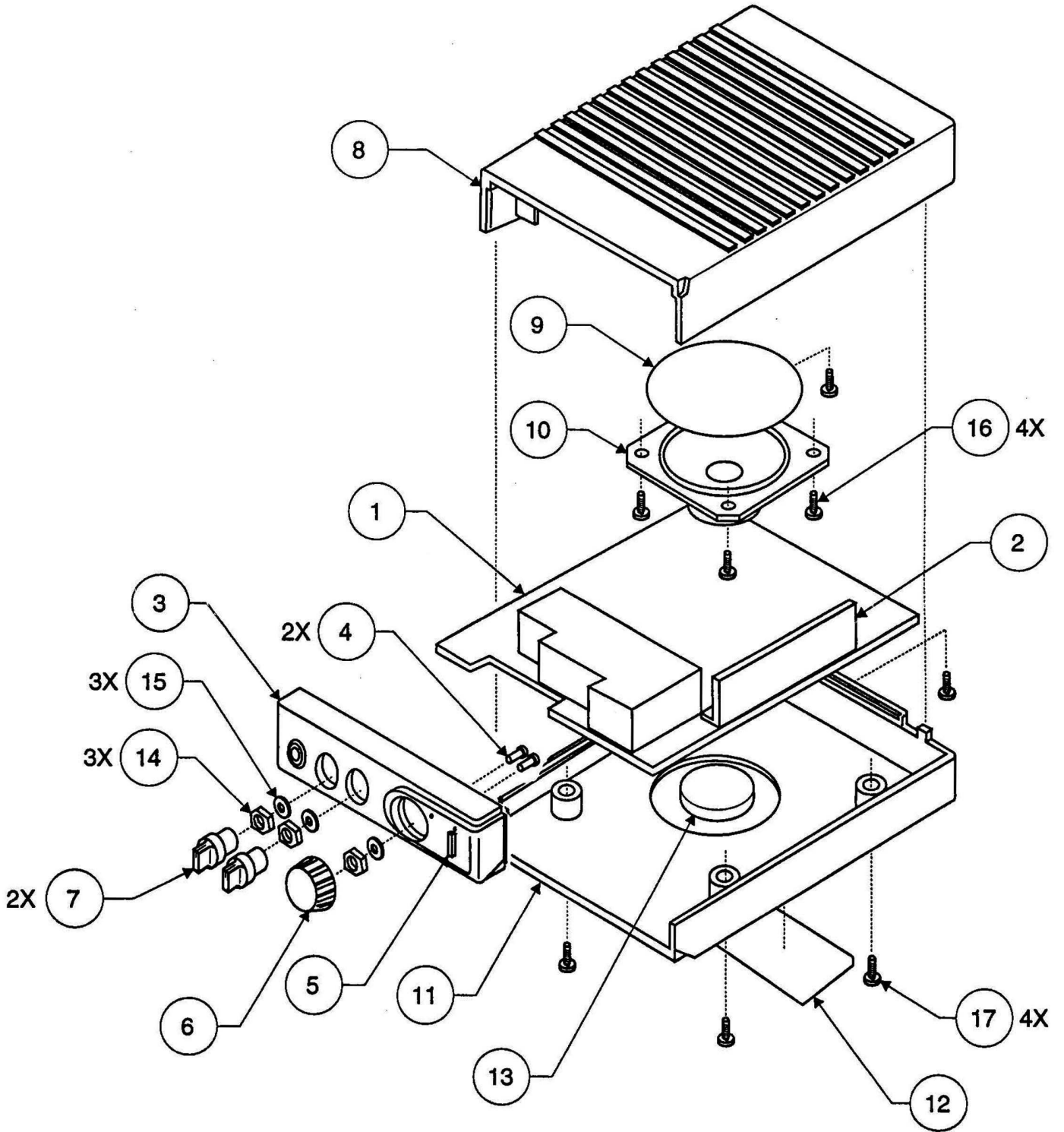
The LED (LD2) will stay lit when the audio input signal level is too high, and will not light when the audio input signal level is too low.

**Note:** This Indicator does not function on the following conditions:

When DSP switch (SW3) is set to the " off " position.

When DSP switch (SW3) is set to the "on" position and filter switch (SW2) is set to the "CW" position.

# Exploded Views



A761001A

## Exploded View Part List

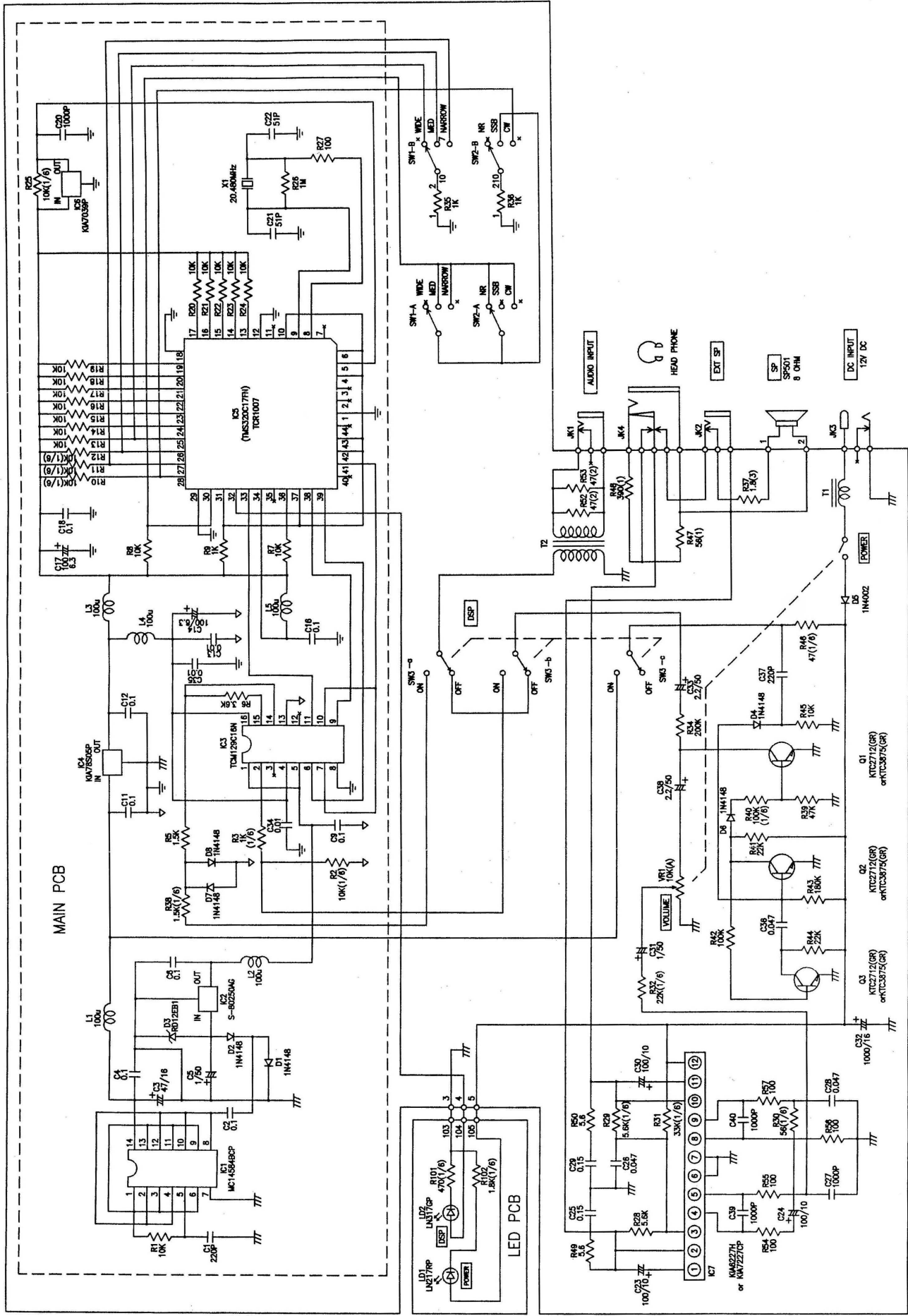
Ref. No.	Description	RS Part No.	MFR Part No.
1	PCB Assy, Main		U-25832-
2	Heat Sink, A1100P, DEGR		471011120A
Not Shown	Screw, Taptite, 3x8BT-B, Heat Sink		HCBB3008SY
Not Shown	Screw, 3x10B, For Heat Sink		HMB03010SY
Not Shown	Nut, Flange, 3FN, For Heat Sink		HANF300-SY
Not Shown	Case, Shield, SPTE, DEGR		473010810B
Not Shown	Plate, Shield, SPTE, DEGR		473211610A
Not Shown	Sheet, Insulation, Fiber		483013560A
Not Shown	PCB Assy, LED		U-25833-
	Panel Assy, Front		MT00412
3	Panel, Front, ABS 94HB		701610110A
4	Lens, PMMA, 94HB		715110540A
5	Knob, 25, ABS, 94HB, For Push		655210110A
6	Knob, 25, ABS, 94HB, For Vol		652511110A
7	Knob, 25, ABS, 94HB, Function		652511120A
	Cabinet Assy, Top		MT00413
8	Cabinet, Top, ABS 94HB		601212820A
9	Net, Nylon Screen		851311010A
10	Speaker, D87, 8ohm, 8W		271011110A or 271011111A
	Cabinet Assy, Bottom		MT00414
11	Cabinet, Bottom, ABS 94HB		601312410A
12	Label, Rating, PE-Sheet		738014200A
13	Cushion, NEOP Sponge, t=3.5		851020790A
Not Shown	Cord, Patch, With 2 Plugs, L=120		313510260A
Not Shown	Holder Assy, Fuse		MT00415
Not Shown	Holder, Fuse, With Lead Wire		197210160A
Not Shown	Fuse, 125V, 2A		251010310A or 251010311A
Not Shown	Label, Warning, Sticker		733311480B
Not Shown	Holder, SPCC, Paint		411117350A
Not Shown	Ass'y Spare Parts		MT00416
Not Shown	Bolt, 5x16H		HBH05016SY
14	Nut, 5N-1		HANN501-SY
15	Washer, 5W		HAWP50SSSY
Not Shown	Washer, Spring, 5SW		HAWS50SSSY
Not Shown	Screw, Tapping, 5x20, PT-2		HTP55020SY
Not Shown	EXT/INT Hardware Kit		HWK0210543
16	Screw, Taptite, 3x6BT-B, For SP		HCBB3006SY
17	Screw, Taptite, 3x12BT-B, Top/Bottom		HCBB3012SY
Not Shown	Screw, Taptite, 3x8BT-B, Heat Sink		HCBB3008SY
Not Shown	Screw, 3x10B, For Heat Sink		HMB03010SY
Not Shown	Nut, Flange, 3FN, For Heat Sink		HANF300-SY

# Parts List

<u>Reference #</u>	<u>Description</u>	<u>RS Part #</u>	<u>MFR Part #</u>
C1, 37	Cap, Cer, 220pF, 50V, 5%		CBVAK221J*
C2, 4, 6, 9, 11, 12, 16, 18	Cap, Cer, 0.1uF, 25V, 10%		CJVEI104K*
C3	Cap, Elec, 47uF, 16V, 20%		CEB1G476M*
C5	Cap, Elec, 1uF, 50V, 20%		CEB1K105M*
C10	Cap, Elec, 4.7uF, 35V, 20%		CEB1J475M*
C13, 34, 35	Cap, Cer, 0.01uF, 25V, 10%		CJVEI103K*
C14	Cap, Elec, 47uF, 6.3V, 20%		CEB1D476M*
C17	Cap, Elec, 100uF, 6.3V, 20%		CEB1D107M*
C20, 27, 39, 40	Cap, Cer, 1000pF, 50V, 10%		CJVEK102K*
C21, 22	Cap, Cer, 51pF, 50V, 5%		CBVAK510J*
C23, 24, 30	Cap, Elec, 100uF, 10V, 20%		CEA1E107M*
C25, 29	Cap, Cer, 0.15pF, 16V, 10%		CJVRG154K*
C26, 28, 36	Cap, Cer, 0.047uF, 25V, 10%		CJVEI473K*
C31	Cap, Elec, 1uF, 50V, 20%		CEA1K105M*
C32	Cap, Elec, 1000uF, 16V, 20%		CECCG108M*
C33, 38	Cap, Elec, 2.2uF, 50V, 20%		CEB1K225M*
D1, 2, 4, 6	Diode, Silicon, 1N4148, Regulator		SDSIT0006- or SDSIT0146- or SDSIT6049-
D3	Diode, Zener, RD12E, RANK:B1		SZRD12E-B1
D5	Diode, Silicon, 1N4002, Protector		SDSIT0065- or SDSIT0145- or SDSIT6032-
D7, 8	Diode, Silicon, LL4148		SDSI56002- or SDSI56003- or SDSI56005-
L1, 2, 3, 4	Coil, Ind, 100uHKLAL03TB Coil, Ind, 100uHKSPT0305		142011510A or 142060330A
L5	Coil, Ind, 100uHKLAL03TB Coil, Ind, 100uHKSPT0305		142011510A or 142060330A
Q1, 2, 3	Xsistor, KTC2712(GROSCAMP) Xsistor, KTC3875(GR,		STK12712-G or STK13875-G
R1, 7, 8, 13, 14, 15, 16, 17, 18 R19, 20, 21, 22, 23, 24, 45	Res, MG, 10K, 1/10W, 5%		RG0TV103J*
R2, 10, 11, 12, 25	Res, CF, 10K, 1/6W, 5%		RC0XT103J*
R3	Res, CF, 1K, 1/6W, 5%		RC0XT102J*
R5	Res, MG, 1.5K, 1/10W, 5%		RG0TV152J*
R6	Res, MG, 3.6K, 1/10W, 5%		RG0TV362J*
R9, 35, 36	Res, MG, 1K, 1/10W, 5%		RG0TV102J*
R26	Res, MG, 1M, 1/10W, 5%		RG0TV105J*
R27, 54, 55, 56	Res, MG, 100, 1/10W, 5%		RG0TV101J*
R57			
R28	Res, MG, 5.6K, 1/10W, 5%		RG0TV562J*
R29	Res, CF, 5.6K, 1/6W, 5%		RC0XT562J*
R30	Res, CF, 56, 1/6W, 5%		RC0XT560J*

<u>Reference #</u>	<u>Description</u>	<u>RS Part #</u>	<u>MFR Part #</u>
R31	Res, CF, 33K, 1/6W, 5%		RC0XT333J*
R32	Res, CF, 22K, 1/6W, 5%		RC0XT223J*
R34	Res, MG, 200K, 1/10W, 5%		RG0TV204J*
R37	Res, MF, 1.8, 3W, 5%		RM03P1R8J*
R38	Res, CF, 1.5K, 1/6W, 5%		RC0XT152J*
R39	Res, MG, 47K, 1/10W, 5%		RG0TV473J*
R40	Res, CF, 100K, 1/6W, 5%		RC0XT104J*
R41, 44	Res, MG, 22K, 1/10W, 5%		RG0TV223J*
R42	Res, MG, 100K, 1/10W, 5%		RG0TV104J*
R43	Res, MG, 180K, 1/10W, 5%		RG0TV184J*
R46	Res, CF, 47, 1/6W, 5%		RC0XT470J*
R47	Res, MF, 56, 1W, 5%		RM01P560J*
R48	Res, MF, 390, 1W, 5%		RM01P391J*
R49, 50	Res, MG, 5.6, 1/10W, 5%		RG0TV5R6J*
R52, 53	Res, MO, 47, 2W, 5%		RN02M470J*
R101	Res, CF, 470, 1/6W, 5%		RC0XT471J*
R102	Res, CF, 1.8K, 1/6W, 5%		RC0XT182J*
T1	Coil, Choke, EI19HKP93284		144010201A or
	Coil, Choke, EI19		144010202A
T2	Xformer, Matching, AT-14E-1		10252250MA or
	Xformer, Matching, EI14HF/B2534P		102700953A
X1	Cry, 20.480MHz, HC-49/U		391013060A or
			391060700A
IC1	IC, MC14584BCP, Trigger		SIMD4584B-
IC2	IC, S-80250AG, Regulator		SISS80250A
IC3	IC, TCM129C16N, Frequency Processor		SICT129C16
IC4	IC, KIA78S05P, Regulator		SIKA78S05P or
	IC, NJM78L05		SINM78L05A
IC5	IC, TCR1007, D16041FN, Microprocessor		SICR1007--
IC6	IC, KIA7039P, Regulator		SIKA7039P-
IC7	IC, KIA6227H, Frequency Processor		SIKA6227H- or
	IC, KIA7227CP		SIKA7227CP
JK1, 2	Jack, 3.5mm, HSJ0615-01-010		191201330A
JK3	Jack, DC Power, HEC0470-01-230		196204200A or
	Jack, DC Power, DJ-0702-020		196204202A or
	Jack, DC Power, DC-470		196204203A
JK4	Jack, 6.3mm, HTJ-064-07E		191010340A
SW1, 2	Switch, Rotary, SRBM13NL15		181110420A
SW3	Switch, Push, SPUY19-4N		182111280A or
	Switch, Push, SPUY19C602		182111281A
VR1	Pot, Rotary, 10KAL15W/SW		172910400A or
			172910401A
LD1	LED, LN217RP		SL-R101370 or
	LED, HLR8-215RL		SL-R60053-
LD2	LED, LN317GP		SL-G101390 or
	LED, HLR8-213L		SL-G60013-





C761001A

NOTES: (1) ALL RESISTANCE VALUES ARE INDICATED IN " OHM " ( K=10<sup>3</sup> OHM, M=10<sup>6</sup> OHM ).  
 (2) ALL CAPACITANCE VALUES ARE INDICATED IN " uF " ( P=10<sup>-6</sup> uF ).