

MAINTENANCE MANUAL

SPEAKER KITS

P29/7720041000 (350A1371P5) THRU P29/7720041005 (350A1371P10)

AND

SPEAKER ASSEMBLIES

P29/7720042000 THRU P29/7720042002

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Table 1 – Speaker Kit And Speaker Assemblies

TYPE	BRAND	CONTENTS *	PART NUMBER
Desktop Kit	Ericsson	<ul style="list-style-type: none"> • one (1) select speaker (select Speaker Assembly & case) • one (1) unselect speaker (unselect Speaker Asm. & case) • two (2) 10-foot (3.05 meters) cables 	P29/7720041003 (350A1371P8)
Desktop Kit	GE	<ul style="list-style-type: none"> • one (1) select speaker (select Speaker Assembly & case) • one (1) unselect speaker (unselect Speaker Asm. & case) • two (2) 10-foot (3.05 meters) cables 	P29/7720041000 (350A1371P5)
Rack-Mount Kit (with gooseneck mic mount)	Ericsson	<ul style="list-style-type: none"> • one (1) select speaker (select Speaker Assembly) • one (1) unselect speaker (unselect Speaker Assembly) • one (1) rack-mount frame & bezel assembly with gooseneck mic mount (mic <i>not</i> included) & two (2) blank panels • two (2) 10-foot (3.05 meters) cables 	P29/7720041004 (350A1371P9)
Rack-Mount Kit (with gooseneck mic mount)	GE	<ul style="list-style-type: none"> • one (1) select speaker (select Speaker Assembly) • one (1) unselect speaker (unselect Speaker Assembly) • one (1) rack-mount frame & bezel assembly with gooseneck mic mount (mic <i>not</i> included) & two (2) blank panels • two (2) 10-foot (3.05 meters) cables 	P29/7720041001 (350A1371P6)
Rack-Mount Kit	Ericsson	<ul style="list-style-type: none"> • one (1) select speaker (select Speaker Assembly) • one (1) unselect speaker (unselect Speaker Assembly) • one (1) rack-mount frame & bezel assembly and two (2) blank panels • two (2) 10-foot (3.05 meters) cables 	P29/7720041005 (350A1371P10)
Rack-Mount Kit	GE	<ul style="list-style-type: none"> • one (1) select speaker (select Speaker Assembly) • one (1) unselect speaker (unselect Speaker Assembly) • one (1) rack-mount frame & bezel assembly and two (2) blank panels • two (2) 10-foot (3.05 meters) cables 	P29/7720041002 (350A1371P7)
Speaker Assembly With Cable	(none)	<ul style="list-style-type: none"> • one (1) Speaker Assembly • one (1) 10-foot (3.05 meters) cable 	P29/7720042000
Rack-Mountable Select Speaker Assembly With Cable	(none)	<ul style="list-style-type: none"> • one (1) select Speaker Assembly • one (1) 10-foot (3.05 meters) cable 	P29/7720042001
Rack-Mountable Unselect Speaker Assembly With Cable	(none)	<ul style="list-style-type: none"> • one (1) unselect Speaker Assembly • one (1) 10-foot (3.05 meters) cable 	P29/7720042002

* With the exception of mating the 10-foot cable to the Speaker Assembly, each Speaker Kit is completely assembled when shipped from the factory.

DESCRIPTION

Speaker Kits used with the Enhanced Audio Enclosure consist of mechanical hardware, one or more Speaker Assemblies, and cables to interconnect each Speaker Assembly to the Enhanced Audio Enclosure. For a given Enhanced Audio Enclosure, one Speaker Assembly is the "select speaker" and the remaining are the "unselect speakers."

As shown in Table 1, the Speaker Kits' mechanical hardware may be of several different varieties providing either desktop speaker operation in the form of a self-contained single-speaker case or a rack-mount version in the form of a standard 19-inch EIA rack mount assembly. Rack-mount versions may be equipped with up to four (4) Speaker Assemblies providing one (1) select and three (3) unselect speakers in a single 3-rack-unit-high assembly. See the assembly drawings and parts lists in this manual for additional mechanical assembly details.

Each Speaker Assembly consists of a high-quality magnetically-shielded speaker, a Speaker Amp Board which accommodates the audio power amplification circuitry, a front panel, a panel-mounted volume control potentiometer, and mechanical hardware. This unit may be installed in the desktop case or in the rack-mount frame. Since a magnetically-shielded speaker is employed, this assembly may be located near a video display monitor ("CRT") without causing monitor distortion. The difference between the select and unselect Speaker Assemblies is front panel labeling.

The Speaker Amp Board is the basis of the circuit analysis and the testing procedures within this manual. It is mounted just behind the speaker on long metal stand-offs fastened to the front panel. It receives +12 Vdc operating power from the Enhanced Audio Enclosure via the interconnect cable. This cable also routes the low-power audio signals from the Enhanced Audio Enclosure to the Speaker Amp Board. The board can drive the speaker with up to five (5) watts of audio power.

CIRCUIT ANALYSIS

DC POWER INPUT

The ac-to-dc switching power supply within the Enhanced Audio Enclosure supplies dc power to all Speaker Assemblies used with the console. As previously stated, dc power is applied to the Speaker Amp Board via the cable from the Enhanced Audio Enclosure. This same cable also carries the low-power speaker audio signals from the Enhanced Audio Enclosure.

The cable from the Enhanced Audio Enclosure plugs to the DB-9 connector identified as J1 on the Speaker Amp Board. J1's pin-out is pin-to-pin identical with the Enhanced Audio Enclosure's DB-9 speaker connectors' pin-outs. As shown in the schematic diagram in this manual, J1 pins 4 and 5 provide +12 Vdc connections and J1 pins 7 and 8 provide ground connections. Low-power speaker audio signals from the Enhanced Audio Enclosure are applied to J1 pins 1 and 2.

Polyswitch[®] thermistor PTH1, which provides a resettable fuse function, couples the +12 Vdc power from J1 pins 4 and 5 to the Speaker Amp Board's +12VPA power line. Capacitors C28 and C29 provide supply line decoupling near PTH1. The +12VPA power line is distributed through-out the Speaker Amp Board.

VOLTAGE REFERENCE CIRCUIT

One operational amplifier within quad op-amp U3 (pins 8, 9 & 10) and the associated components generate a dc bias reference voltage which is one-half the power supply voltage. This 6 Vdc bias line is identified as VBIAS on the schematic.

Resistors R25 and R26 divide the +12VPA power line voltage in half and the resultant 6 Vdc power is applied to the non-inverting (+) input of U3 at pin 10. Capacitors C24 and C31 decouple the +12VPA line near the op-amp. U3 (pins 8, 9 & 10) is wired as a voltage follower and thus U3 pin 8 is always 6 Vdc when the Speaker Amp Board is powered-up. R33 at the op-amp's output charges the VBIAS line's filter and decoupling capacitors C30 and C32 to approximately 6 Vdc. R34 is a power-off bleed resistor.

AUDIO PATH

Differential Input Amplifier

A differential amplifier stage is employed as the very first audio stage on the Speaker Amp Board. This stage does not amplify common-mode signals such as 60 Hz hum which may appear on the two inputs. It also eliminates the need for coupling transformers.

As previously stated, low-power speaker audio signals from the Enhanced Audio Enclosure are applied to the Speaker Amp Board at J1 pins 1 and 2 – the differential audio input. Typical audio test signal level between pins 1 and 2 is 436 mVp-p or approximately 1.2 Vp-p into this high-impedance input.

Capacitors C14 and C15 ac-couple audio signals into the input of the differential amplifier stage, op-amp U3 (pins 5, 6 & 7) and the associated components. This stage's voltage gain is approximately 3 dB at voice audio

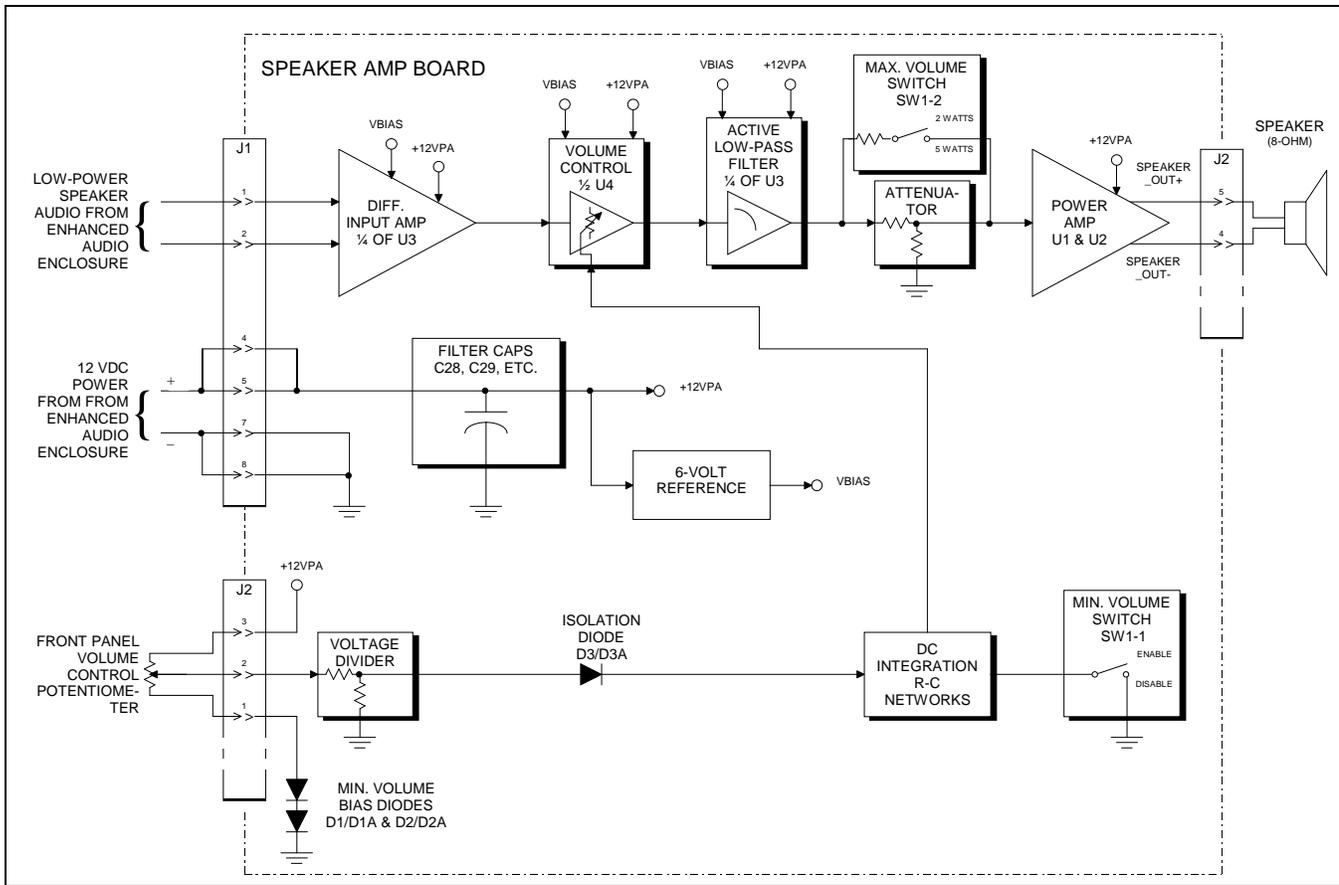


Figure 1 – Speaker Amp Board Block Diagram

frequencies. U3's output at pin 7 is applied to the volume control circuit via C21.

Transient voltage suppressor TVS1 protects the op-amp's inputs from excessive voltage surges which may appear on the differential inputs. It is an 8-pin surface-mount device that contains four (4) independent 5-volt suppressers. As shown in the schematic diagram, each op-amp input has two suppressers in parallel, clamping the input to ground.

Volume Control Circuit

The Speaker Amp Board's volume control circuit utilizes one-half of dual transconductance op-amp U4. Basically, this stage provides volume control based on the dc voltage level on the volume pot's wiper; no audio signals are routed through the volume control pot. Volume (gain) control is accomplished by varying the current through U4 pin 1.

The volume control pot is mounted on the front panel of the Speaker Assembly. As shown on the schematic diagram, J2 pins 1, 2 & 3 and the associated cable provide the interconnections between the pot and the Speaker Amp Board. Table 2 indicates the volume pot's wiper voltage

range – approximately 1.4 Vdc at a minimum volume and 11.9 Vdc at a maximum volume. Before it is applied to U4 pin 1 as a direct current source, the pot's wiper voltage is integrated or "smoothed" by several R-C networks.

Resistors R13, R14 & R17 and the setting of DIP switch SW1 position 1 determine the minimum volume level. When SW1 position 1 is open, the three resistors pull U4 pin 1 slightly more positive at minimum volume pot settings. This slightly increases U4's gain at minimum pot settings and thus the minimum volume feature is enabled or activated. Refer to the board set-up section within LBI-39101 for additional DIP switch set-up information.

Table 2 – Approximate Volume Control Voltages

VOLUME SETTING	WIPER VOLTAGE (J2 Pin 2)	U4 PIN 1 VOLTAGES WITH SW1 POSITION 1:	
		OPEN (OFF)*	CLOSED (ON)
Maximum	11.90 Vdc	1.37 Vdc	1.37 Vdc
Minimum	1.40 Vdc	1.13 Vdc	0.86 Vdc

* OPEN (OFF) is factory setting = minimum volume enabled.

Low-Pass Filter

A low-pass filter stage is located between the output of the volume control stage and the maximum volume switch. This active filter circuit is formed by U3 (pins 12, 13 & 14) and the associated R-C networks. It reduces any high-frequency signals which may be present in the audio signal. It also provides a buffer function between U4 and the speaker power amplifier circuit.

Maximum Volume (Power Output) Switch

Using the attenuator network at the output of the low-pass filter, DIP switch SW1 position 2 sets the Speaker Amp Board's maximum output power capability. When the switch is "OPEN" or "OFF", the maximum speaker volume is limited to approximately 2-watts. When the switch is "CLOSED" or "ON" the maximum output power increases to approximately 5-watts. Both wattage figures assume the volume control pot is set at maximum (fully clockwise) and a nominal or test audio signal input level of 436 millivolts rms is applied to the board's audio input. Refer to the board set-up section within LBI-39101 for additional DIP switch set-up information.

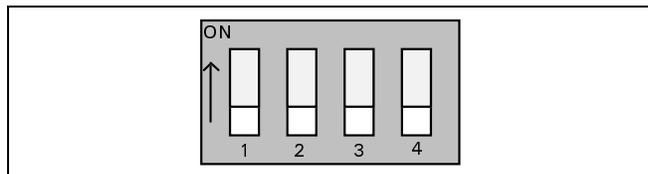


Figure 2 – Speaker Amp Board SW1 Factory Setting

Table 3 – SW1 Selection Definitions

SW1 POSITION	OPEN (OFF)	CLOSED (ON)
1	minimum volume enabled *	minimum volume disabled
2	2-watt maximum speaker power *	5-watt maximum speaker power
3	(not used) *	(not used)
4	(not used) *	(not used)

* OPEN (OFF) is factory setting for all SW1 positions.

Speaker Power Amplifier

The speaker power amplifier circuit consists of two TDA2003 (or equivalent) 5-pin IC amplifiers wired in a bridge (differential) output fashion. Both ICs, U1 and U2, operate from the filtered +12 Vdc power supply line identified +12VPA on the schematic diagram. These IC

audio amplifiers are equipped with internal short-circuit protection and thermal-shutdown circuits.

Audio from the low-pass filter stage is coupled into the amp circuit via the maximum power selection circuit and capacitor C12. The upper amplifier, U2, drives the speaker's SPEAKER_OUT+ line. Feedback resistors R8 and R2//R3 set U2's voltage gain to approximately twenty-five (25) or 28 dB. C9 couples the attenuated feedback signal into U2's inverting (-) input at pin 2.

The attenuated feedback signal is also applied to the inverting (-) input of U1 via R2 and C8. This permits U1 to drive the SPEAKER_OUT- line exactly 180° out-of-phase in relation to the SPEAKER_OUT+ line. R1 and R2 set U1's voltage gain approximately equal to the gain of the upper amp, U2.

Both speaker output terminals, J2 pins 4 and 5, operate at an approximate bias of 5.6 Vdc. The R-C networks on the output leads provide stabilization.

TESTING

RECOMMENDED TEST EQUIPMENT

The following list represents test equipment required for Speaker Assembly testing. Other test equipment may be substituted provided it is electrically equivalent or superior in accuracy and operational range to that which is listed.

- Hewlett Packard 204C Audio Signal Generator (600-ohm output impedance)
- Fluke 87 True-RMS Handheld Digital Multimeter
- Tektronix 2205 Portable 20 MHz Analog Oscilloscope
- Hewlett Packard E3615A Adjustable Regulated DC Power Supply (0 – 20 Vdc, 3 amperes)
- Test Leads

TESTS

Initial Set-Up

- ❑ If necessary, disconnect the Speaker Assembly from the Enhanced Audio Enclosure by unplugging the cable at the rear of the Speaker Assembly. The cable's DB-9 connector securing screws may need to be loosened.
- ❑ If the Speaker Assembly is a desktop version, disassemble it to gain access to the Speaker Amp Board as follows: Remove the four (4) screws from

the back of the case and separate the case's front and rear sections.

- ❑ If the Speaker Assembly is a rack-mount version, removal of the assembly from the rack-mount frame is recommended: Remove the screws that secure the Speaker Assembly to the rack-mount frame.
- ❑ Record present settings of DIP switch SW1 on the Speaker Amp Board. Normally, all SW1 switches are set to "OPEN" or "OFF" when the Speaker Assembly ships from the factory.

Testing

1. Power-Up

- ❑ Set the external power supply's current limit point to approximately 1.0 ampere.
 - ❑ Apply +12 Vdc (± 0.05 Vdc) to the Speaker Amp Board from the external power supply. As shown in the schematic diagram, the positive (+) input is J1 pins 4 and 5 and the negative (-) input is J1 pins 7 and 8. If not available, fabrication of a test cable for this purpose is recommended. *Do not ground to either heat sink.*
 - ❑ Verify the quiescent power supply current (no audio signal applied) measures less than 100 milliamps.
 - ❑ Connect the ground lead of the multimeter to the board's ground near C28 and C29. *Do not ground to either heat sink.*
 - ❑ Verify pin 5 at each audio power amp IC is 12 Vdc (± 0.2 Vdc). Pin 5 can be located as follows: With the board in an up-right position (heat sinks at top), pin 5 is the far right-hand pin at the bottom of each IC.
 - ❑ Verify TP6 and TP7 are 6.25 Vdc (± 0.3 Vdc).
 - ❑ Verify both differential speaker outputs at J1 pins 4 and 5 are each 5.6 Vdc (± 0.5 Vdc) referenced to ground.
- ❑ Set the volume control potentiometer to a minimum volume (fully counterclockwise) position. The pot should remain in this position throughout this step. The dc voltage at the pot's wiper (or J2 pin 2) should measure approximately 1.4 Vdc.
 - ❑ Apply a 436 millivolt rms 1 kHz sine wave signal across the board's differential audio inputs at J1 pins 1 and 2. Connections are not polarity sensitive and no termination or load resistor is needed at this relatively high-impedance input.
 - ❑ With the multimeter set for ac measurements, measure across J1 pins 1 and 2 to verify the signal across the differential input is actually 436 millivolts rms (± 10 millivolts). Ensure both multimeter probes are isolated from ground.
 - ❑ With the minimum volume control position maintained (fully counterclockwise), monitor the ac voltage across the speaker terminals (J2 pins 4 and 5) with the multimeter. Ensure both multimeter probes are isolated from ground. Verify the signal across the speaker is between 40 and 60 mVrms. The multimeter can remain connected across the speaker for the remainder of this step and step 3.
 - ❑ Temporarily set SW1 position 1 "CLOSED" or "ON". This disables the minimum volume level feature.
 - ❑ The signal across the speaker should be less than 10 mVrms.
 - ❑ Return SW1 position 1 to "OPEN" or "OFF".
 - ❑ Set SW1 position 2 "CLOSED" or "ON". This sets the maximum volume level to 5 watts.
 - ❑ With the volume control still at a minimum position, verify the ac voltage across the speaker has increased to between 70 and 110 mVrms.
 - ❑ Separately monitor each differential speaker output (J2 pins 4 and 5) with the scope and verify each sine wave shows minimal distortion. The scope's probe should be grounded near C28 and C29.

3. Maximum Speaker Volume

- ❑ Maintain the 436 mVrms 1 kHz sine wave signal input to the Speaker Amp Board.

NOTE

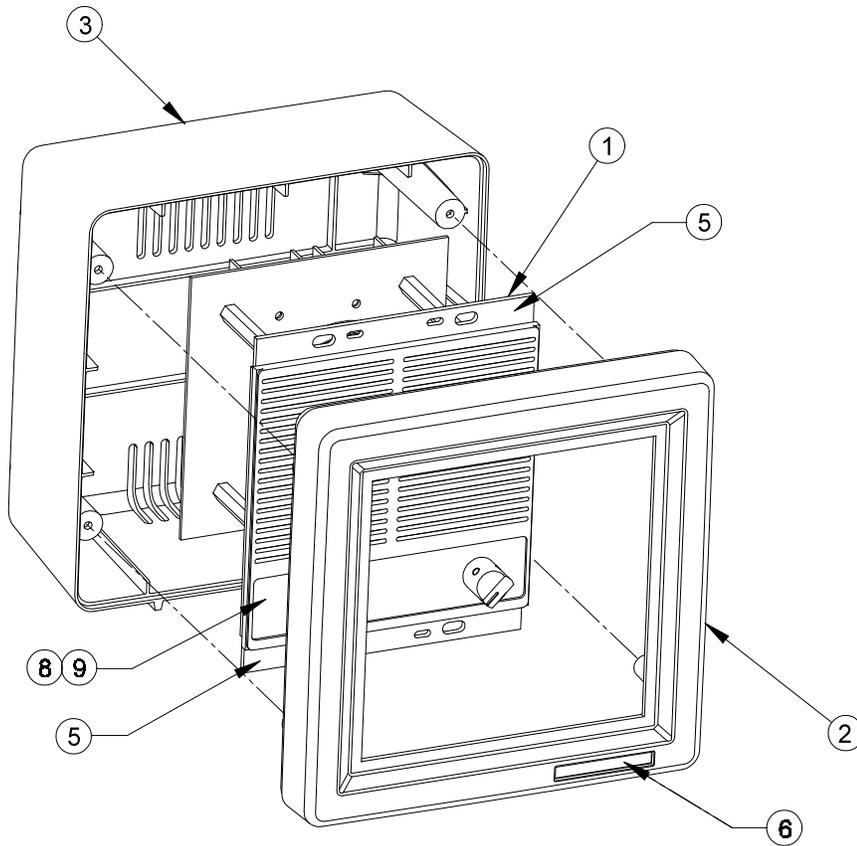
Before proceeding, the service technician may want to temporarily disconnect the Speaker Assembly's speaker and terminate the Speaker Amp Board's output with an 8-ohm (10-watt minimum) resistor. Maximum volume level measurements can then be made across the 8-ohm load with minimal disturbance to external surroundings. **Disconnect dc power before installing the 8-ohm load.**

- ❑ If necessary, set DIP switch SW1 position 2 "CLOSED" or "ON". This sets the maximum volume to 5 watts.
- ❑ Set the volume control potentiometer to a maximum volume (fully clockwise) position. The dc voltage at the pot's wiper (or J2 pin 2) should measure approximately 11.9 Vdc. The pot should be in this position whenever any measurement is made in this step.

- ❑ Monitor the ac voltage across the speaker or 8-ohm load resistor. Ensure both multimeter probes are isolated from ground. Verify the signal is approximately 6.3 Vrms at full volume and power supply current is approximately 750 milliamps.
- ❑ Separately monitor each differential speaker output (J2 pins 4 and 5) with the scope and verify each sine wave shows minimal distortion. Ground the scope's probe near C28 and C29.

4. Completion

- ❑ Remove external dc power and then disconnect all test equipment.
- ❑ Return SW1 positions 1 and 2 to the previous settings.
- ❑ Reassemble and/or reinstall the Speaker Assembly into its case or rack-mount frame.
- ❑ Reconnect the power/signal cable from the Enhanced Audio Enclosure.

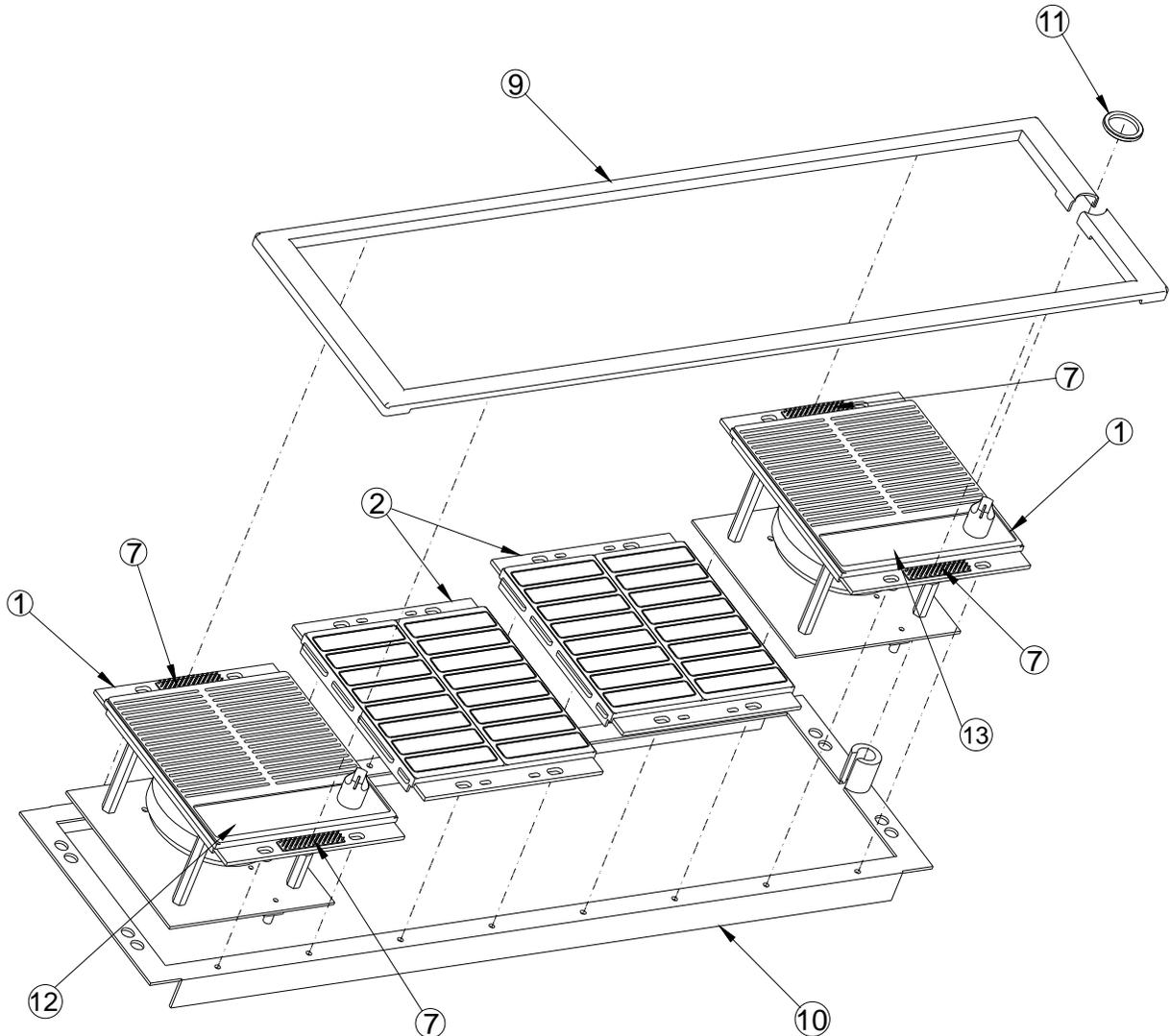
**NOTE**

Refer to the Parts List on page 14 for item number descriptions and part numbers. Items 4 and 10 are not shown.

DESKTOP SPEAKER

(Part Of Desktop Speaker Kit
P29/7720041000 Or P29/7720041003)

(Made From 772-0041-XXX-HD, Rev. A)

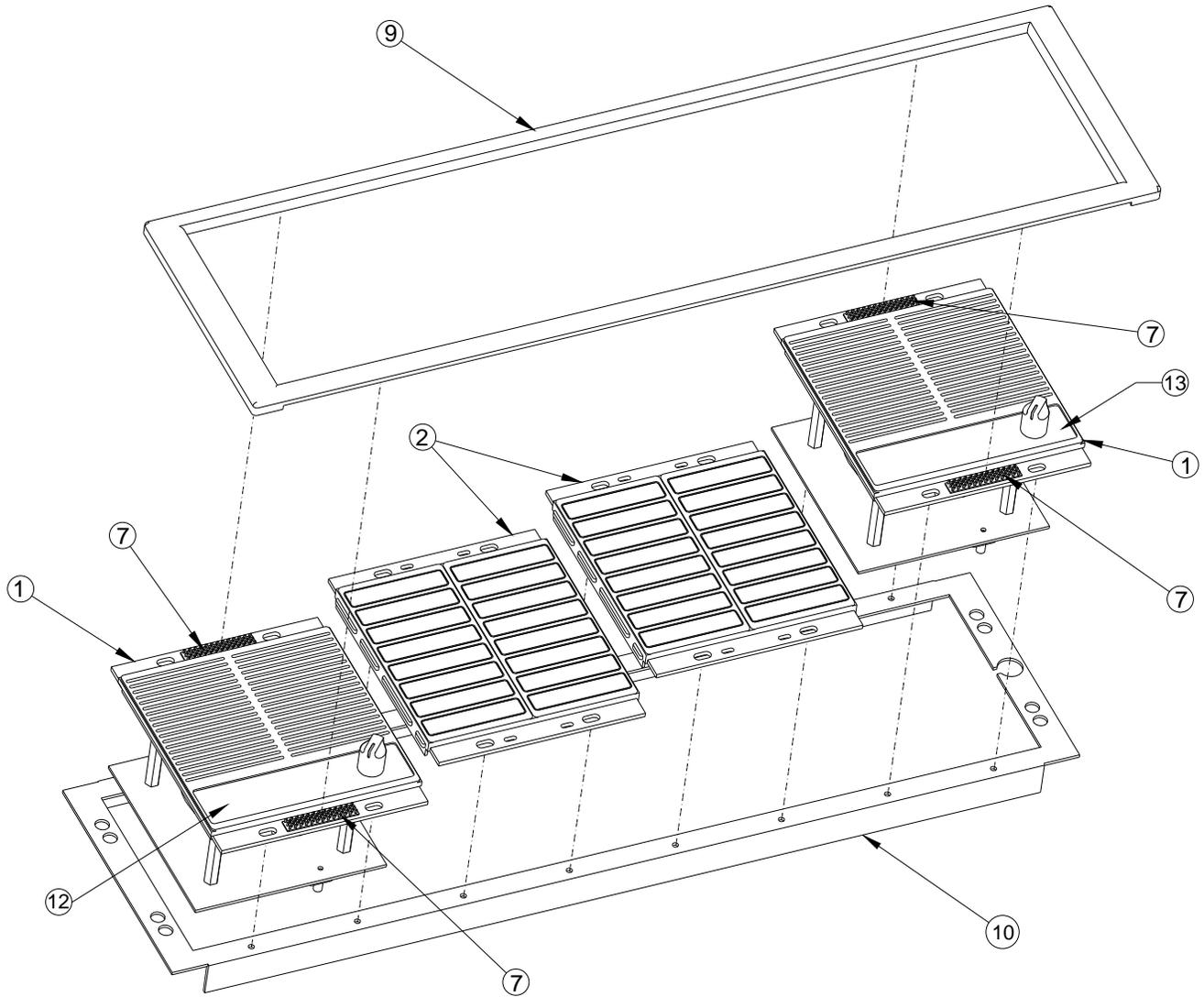
**NOTE**

Refer to the Parts List on page 14 for item number descriptions and part numbers. Items 3, 4, 5, 6, 8, and 14 are not shown.

**RACK-MOUNT SPEAKERS
(WITH GOOSENECK MIC MOUNT)**

(Part Of Rack-Mount Speaker Kit
P29/7720041001 Or P29/7720041004)

(Made From 772-0041-XXX-HD, Rev. A)

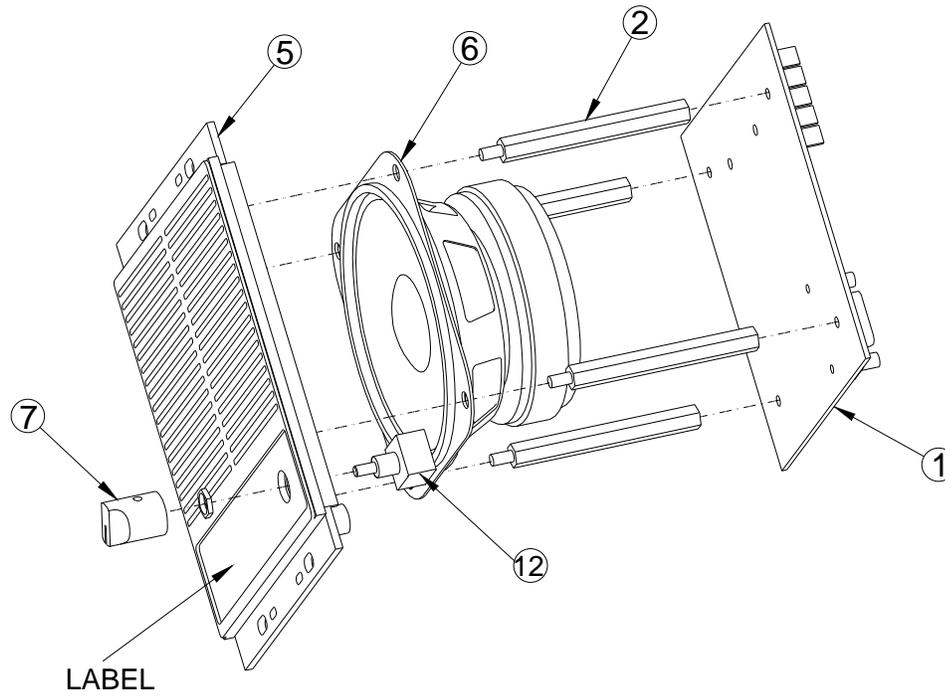
**NOTE**

Refer to the Parts List on page 14 for item number descriptions and part numbers. Items 3, 4, 5, 6, 8, and 14 are not shown.

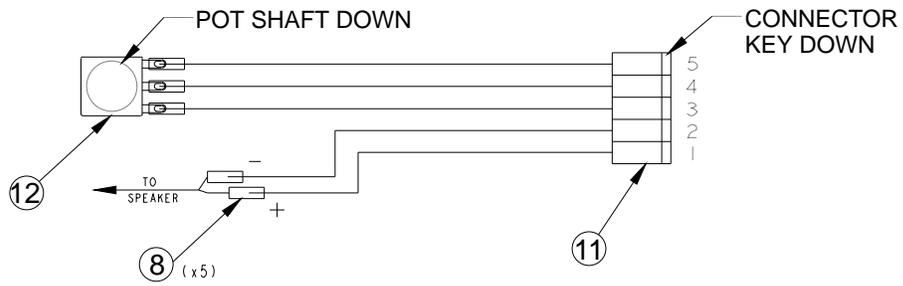
RACK-MOUNT SPEAKERS (WITHOUT GOOSENECK MIC MOUNT)

(Part Of Rack-Mount Speaker Kit
P29/7720041002 Or P29/7720041005)

(Made From 772-0041-XXX-HD, Rev. A)



POT/SPEAKER CABLE

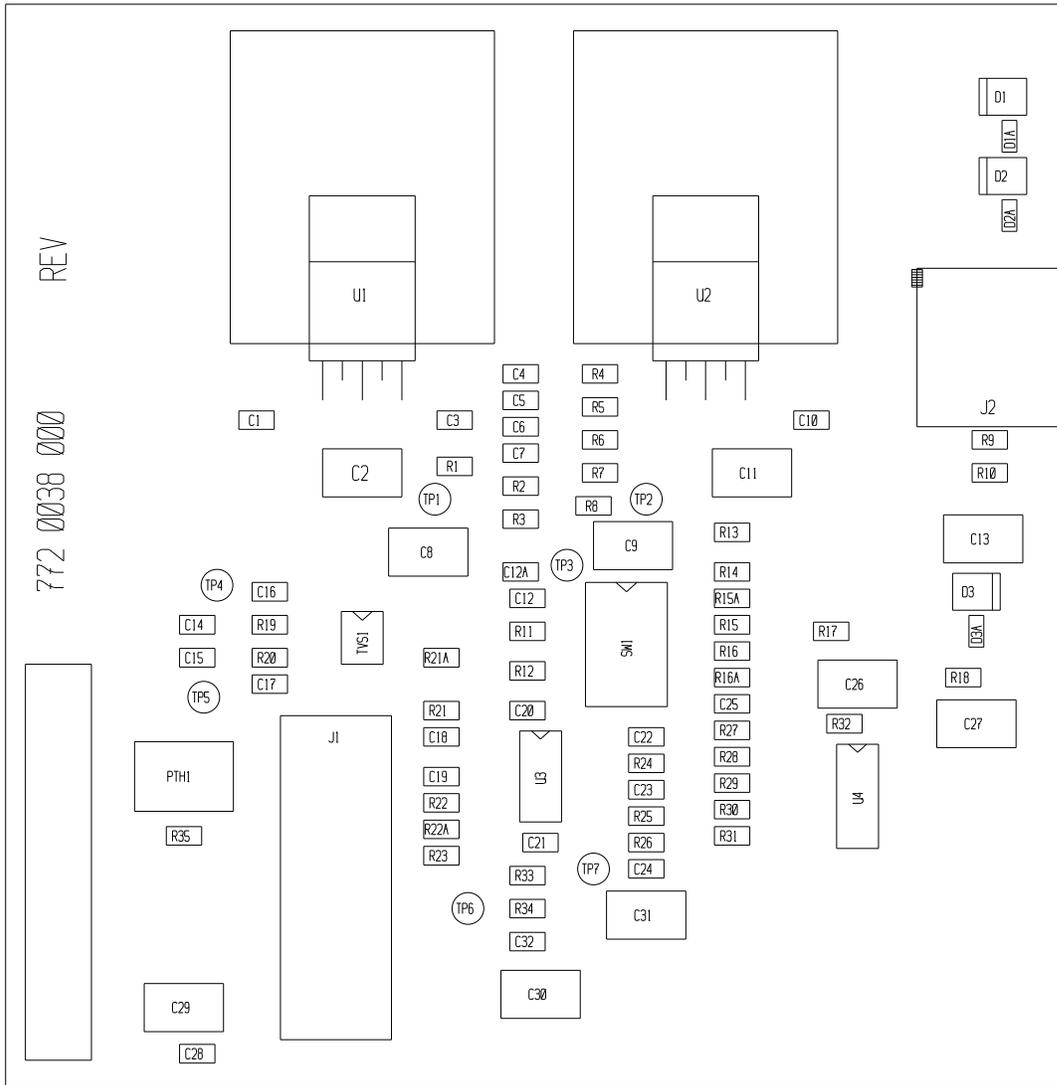


NOTE

Refer to the Parts List on page 14 for item number descriptions and part numbers. Items 3, 4, and 9 are not shown.

**SPEAKER ASSEMBLY
P29/7720042000**

(Made From 772-0042-XXX-HD, Rev. A)

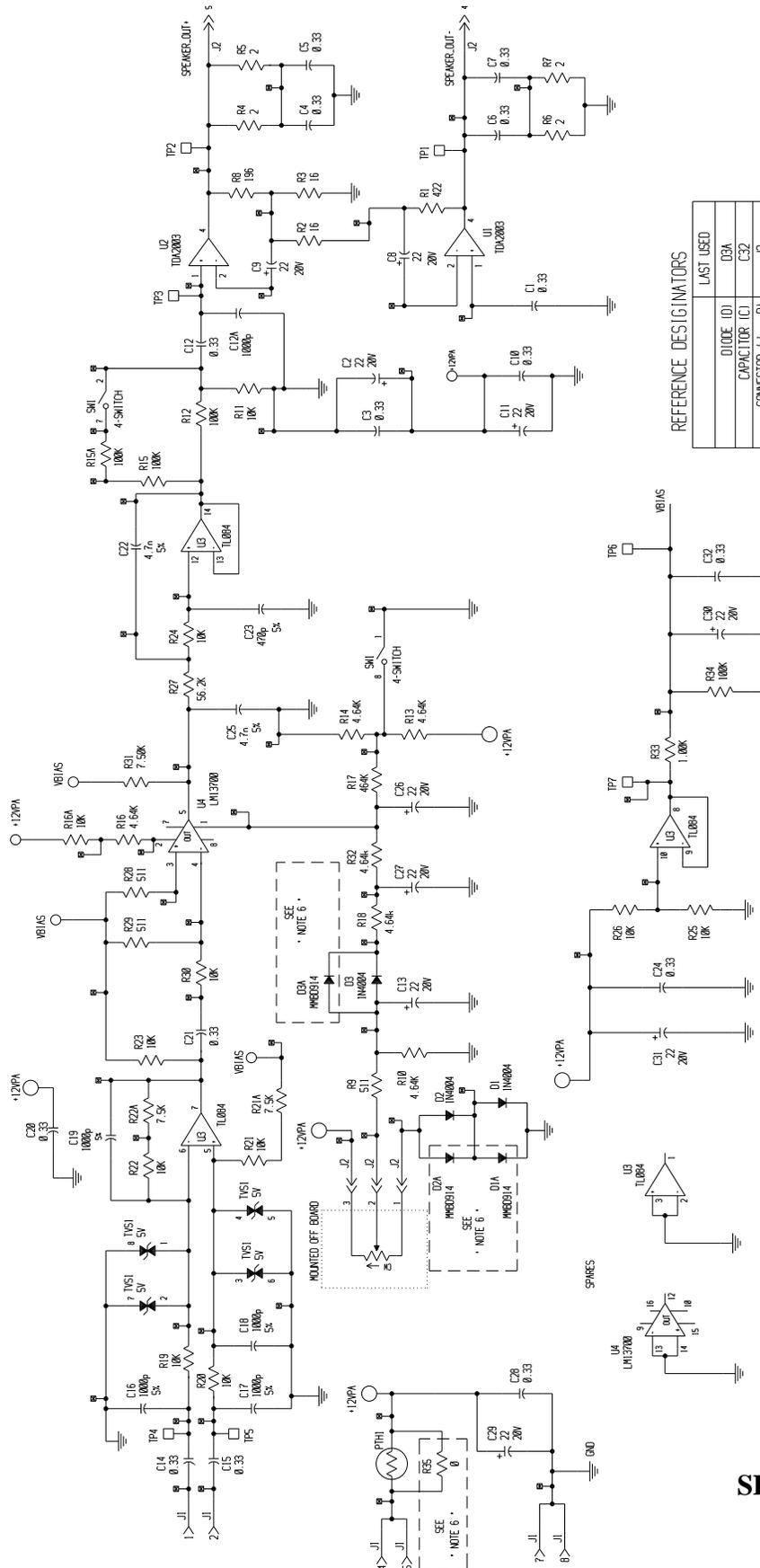


SPEAKER AMP BOARD
P29/7720038000
(350A1371P22)

(772-0038-XXX-HD, Sh. 1, Rev. A)



CAUTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES



REFERENCE DESIGNATORS

REFERENCE DESIGNATOR	LAST USED
DIODE (D)	D3A
CAPACITOR (C)	C32
CONNECTOR (J) or (P)	J2
RELAY (K)	
TRANSISTOR (Q)	
RESISTOR (R)	R35
VARIABLE (VR)	
SWITCH (S)	
TRANSFORMER (T)	
INTEGRATED CIRCUIT (U)	U4

NOTES

1. RESISTANCE VALUES IN OHMS UNLESS OTHERWISE STATED
2. RESISTORS 1/8 WATT UNLESS OTHERWISE STATED
3. CAPACITANCE VALUES IN MICRO FARADS UNLESS OTHERWISE STATED
4. INDUCTANCE VALUES IN MICRO HENRIES UNLESS OTHERWISE STATED
5. THIS SCHEMATIC CORRESPONDS TO REV. C OF THE GEE P.O.S.
6. FOR FUTURE USE ONLY.

POWER TABLE

REF	12V	GND
U1	5	3
U2	3	1
U3	4	2
U4	11	6

SPEAKER AMP BOARD
P29/7720038000
(350A1371P22)

(772-0038-XXX-EC, Sh. 1, Rev. A)

DESKTOP SPEAKER KITS
ERICSSON – ONE SELECT & ONE UNSELECT
P29/7720041003, Rev. A (350A1371P8), AND
GE – ONE SELECT & ONE UNSELECT
P29/7720041000, Rev. A (350A1371P5)

ISSUE 1

ITEM	PART NUMBER	DESCRIPTION
1	P29/7720042000	Speaker Assembly. (Qty. = 2 per kit.) (See separate Parts List for breakdown.)
2	P29/6050033000	Case, front bezel. (Qty. = 2 per kit.)
3	P29/6050034000	Case, back. (Qty. = 2 per kit.)
4	P29/2A104C5405	Screw, machine: 4-40 x 5/16, pan-head Phillips, stainless steel. (Qty = 8 per kit.)
5	P29/1130016000	Adhesive. (Qty. = as required.)
6	P29/6140237000	Label, Ericsson. (Qty. = 2 per kit.) (Used in P29/7720041003.)
6	P29/6140236000	Label, GE. (Qty. = 2 per kit.) (Used in P29/7720041000.)
8	P29/6140234000	Label, select. (Qty. = 1 per kit.)
9	P29/6140235000	Label, unselect. (Qty. = 1 per kit.)
10	P29/5010150000	Cable: DB-9 male to DB-9 female. (Qty. = 2 per kit.)

SPEAKER ASSEMBLY P29/7720042000, Rev. A
SELECT SPEAKER ASSEMBLY P29/7720042001, Rev. A
UNSELECT SPEAKER ASSEMBLY P29/7720042002, Rev. A

ISSUE 1

ITEM	PART NUMBER	DESCRIPTION
1	P29/7720038000	Speaker Amp Board. (See separate Parts List for breakdown.)
2	P29/2090113000	Stand-off: 6-32 x 2 1/4", hex, stainless steel. (Qty required = 4.)
3	P29/2A106C2403	Screw, machine: 6-32 x 3/16", pan-head Phillips. (Qty required = 4.)
4	P29/208A106020	Washer, lock: No. 6, spring, stainless steel. (Qty required = 4.)
5	P29/6050031000	Grill, speaker.
6	P29/3360018000	Speaker.
7	P29/6130024000	Knob: black, 1/8" shaft.
8	P29/1050038000	Tubing, heatshrink: 1/16" x 3/4". (Qty required = 5.)
9	P29/2160002000	Tie, wire: 4". (Qty required = 3.)
11	P29/3800716005	Connector, header: 5-position female.
11	P29/3720062000	Terminal: tin plated, 22 - 30 AWG. (Used with above connector. Qty required = 5.)
12	P29/3100096000	Pot: 1K ohms single-turn w/ 1/8" shaft.
	P29/6140234000	Label, select. (Used in P29/7720042001.)
	P29/6140235000	Label, unselect. (Used in P29/7720042002.)
	P29/5010150000	Cable: DB-9 male to DB-9 female.

RACK-MOUNT SPEAKER KITS
ONE SELECT & ONE UNSELECT (EACH KIT)

All Kits Rev. A

ERICSSON W/ GOOSENECK MNT. P29/7720041004 (350A1371P9)
ERICSSON W/O GOOSENECK MIC MNT. P29/7720041005
(350A1371P10)
GE WITH GOOSENECK MIC MOUNT P29/7720041001 (350A1371P6)
GE W/O GOOSENECK MIC MOUNT P29/7720041002 (350A1371P7)

ISSUE 1

ITEM	PART NUMBER	DESCRIPTION
1	P29/7720042000	Speaker Assembly. (Qty. = 2 per kit.) (See separate Parts List for breakdown.)
2	P29/6050032000	Panel, blank: speaker grill. (Qty. = 2 per kit.)
3	P29/2040010000	Screw, thread forming: No. 6 x 5/16", pan- head Phillips, stainless steel. (Qty. = 16 per kit.)
4	P29/2040011000	Screw, thread forming: No. 10-24 x 3/4", pan-head Phillips, steel. (Qty. = 4 per kit.)
5	P29/2070098000	Nut, spring: No. 10-24. (Qty. = 4 per kit.)
6	P29/2080005000	Washer, lock: No. 10, external tooth. (Qty. = 4 per kit.)
7	P29/1070007000	Velcro: 751-hook, with adhesive.
8	P29/1070006000	Velcro, 1000-loop, with adhesive.
9	P29/6090057001	Bezel, Ericsson: with mic mount cutout. (Qty. = 1 per kit.) (Used in P29/7720041004.)
9	P29/6090057000	Bezel, GE: with mic mount cutout. (Qty. = 1 per kit.) (Used in P29/7720041001.)
9	P29/6090056001	Bezel, Ericsson. (Qty. = 1 per kit.) (Used in P29/7720041005.)
9	P29/6090056000	Bezel, GE. (Qty. = 1 per kit.) (Used in P29/7720041002.)
10	P29/6090558000	Rack, 19-inch: with mic mount. (Qty. = 1 per kit.) (Used in P29/7720041001 and P29/7720041004.)
10	P29/6090559000	Rack, 19-inch. (Qty. = 1 per kit.) (Used in P29/7720041002 and P29/7720041005.)
11	P29/6040701000	Nut, knurled: No. 5/8-27, steel, black. (Used in P29/7720041001 and P29/7720041004.)
12	P29/6140234000	Label, select. (Qty. = 1 per kit.)
13	P29/6140235000	Label, unselect. (Qty. = 1 per kit.)
14	P29/5010150000	Cable: DB-9 male to DB-9 female. (Qty. = 2 per kit.)

PRODUCTION CHANGES

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Rev. A **DESKTOP SPEAKER KITS**
Initial production release.

Rev. A **RACK-MOUNT SPEAKER KITS**
Initial production release.

Rev. A **SPEAKER ASSEMBLIES**
Initial production release.

**SPEAKER AMP BOARD
P29/7720038000, Rev. A
(350A1371P22)**

ISSUE 1

SYMBOL	PART NUMBER	DESCRIPTION
----- CAPACITORS -----		
C1	P29/31A3342C42	Chip, ceramic: 0.33 μ F \pm 20%, 50 V.
C2	P29/31B226073B	Chip, tantalum: 22 μ F \pm 10%, 20 V.
C3 thru C7	P29/31A3342C42	Chip, ceramic: 0.33 μ F \pm 20%, 50 V.
C8 and C9	P29/31B226073B	Chip, tantalum: 22 μ F \pm 10%, 20 V.
C10	P29/31A3342C42	Chip, ceramic: 0.33 μ F \pm 20%, 50 V.
C11	P29/31B226073B	Chip, tantalum: 22 μ F \pm 10%, 20 V.
C12	P29/31A3342C42	Chip, ceramic: 0.33 μ F \pm 20%, 50 V.
C12A	P29/31A1021J32	Chip, ceramic: 1000 pF \pm 10%, 100 V.
C13	P29/31B226073B	Chip, tantalum: 22 μ F \pm 10%, 20 V.
C14 and C15	P29/31A3342C42	Chip, ceramic: 0.33 μ F \pm 20%, 50 V.
C16 thru C19	P29/31A1021J32	Chip, ceramic: 1000 pF \pm 10%, 100 V.
C20 and C21	P29/31A3342C42	Chip, ceramic: 0.33 μ F \pm 20%, 50 V.
C22	P29/31A4721J22	Chip, ceramic: 4.7 nF \pm 5%, 100 V.
C23	P29/31A4710J22	Chip, ceramic: 470 pF \pm 5%, 100 V.
C24	P29/31A3342C42	Chip, ceramic: 0.33 μ F \pm 20%, 50 V.
C25	P29/31A4721J22	Chip, ceramic: 4.7 nF \pm 5%, 100 V.
C26 and C27	P29/31B226073B	Chip, tantalum: 22 μ F \pm 10%, 20 V.
C28	P29/31A3342C42	Chip, ceramic: 0.33 μ F \pm 20%, 50 V.
C29 thru C31	P29/31B226073B	Chip, tantalum: 22 μ F \pm 10%, 20 V.
C32	P29/31A3342C42	Chip, ceramic: 0.33 μ F \pm 20%, 50 V.
----- DIODES -----		
D1 thru D3	P29/3420147000	Chip, silicon: 1N4004W.
----- JACKS -----		
J1	P29/3800551000	D-subminiature: 9-position, PC board mount, female contacts.
J2	P29/3800679005	Header: 5-position, right-angle PC board mount, male contacts.
----- POLYSWITCH -----		
PTH1	P29/3130009004	Fuse, resettable.
----- RESISTORS -----		
R1	P29/30C4220201	Chip: 422 ohms \pm 1%, 1/8 W.
R2 and R3	P29/30C1629201	Chip: 16.2 ohms \pm 1%, 1/8 W.
R4 thru R7	P29/30C2009221	Chip: 2 ohms \pm 5%, 1/8 W.
R8	P29/30C1960201	Chip: 196 ohms \pm 1%, 1/8 W.

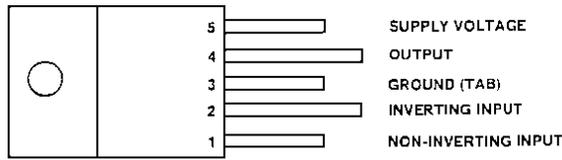
SYMBOL	PART NUMBER	DESCRIPTION
R9	P29/30C5110201	Chip: 511 ohms \pm 1%, 1/8 W.
R10	P29/30C4641201	Chip: 4.64K ohms \pm 1%, 1/8 W.
R11	P29/30C1002201	Chip: 10K ohms \pm 1%, 1/8 W.
R12	P29/30C1003201	Chip: 100K ohms \pm 1%, 1/8 W.
R13 and R14	P29/30C4641201	Chip: 4.64K ohms \pm 1%, 1/8 W.
R15 and R51A	P29/30C1003201	Chip: 100K ohms \pm 1%, 1/8 W.
R16	P29/30C4641201	Chip: 4.64K ohms \pm 1%, 1/8 W.
R16A	P29/30C1002201	Chip: 10K ohms \pm 1%, 1/8 W.
R17	P29/30C4643201	Chip: 464K ohms \pm 1%, 1/8 W.
R18	P29/30C4641201	Chip: 4.64K ohms \pm 1%, 1/8 W.
R19 thru R26	P29/30C1002201	Chip: 10K ohms \pm 1%, 1/8 W.
R21A and R22A	P29/30C7501201	Chip: 7.5K ohms \pm 1%, 1/8 W.
R27	P29/30C5622201	Chip: 56.2K ohms \pm 1%, 1/8 W.
R28 and R29	P29/30C5110201	Chip: 511 ohms \pm 1%, 1/8 W.
R30	P29/30C1002201	Chip: 10K ohms \pm 1%, 1/8 W.
R31	P29/30C7501201	Chip: 7.5K ohms \pm 1%, 1/8 W.
R32	P29/30C4641201	Chip: 4.64K ohms \pm 1%, 1/8 W.
R33	P29/30C1001201	Chip: 1K ohms \pm 1%, 1/8 W.
R34	P29/30C1003201	Chip: 100K ohms \pm 1%, 1/8 W.
----- SWITCHES -----		
SW1	P29/3670014000	Surface-mount: 4-position, SPST DIP.
----- TEST POINTS -----		
TP1 thru TP7	P29/3780023000	Test Point.
----- VOLTAGE SUPPRESSOR -----		
TVS1	P29/3590070000	Linear, surface mount: Quad 5-Volt Transient Voltage Suppressor; SMDA5C.
----- INTEGRATED CIRCUITS -----		
U1 and U2	P29/3480091000	Linear, surface mount: Audio Amplifier; TDA2003H.
U3	P29/3480100601	Linear, surface mount: Quad Op. Amp.; TL084C
U4	P29/3590091000	Linear, surface mount: Dual Trans. Op. Amp.; LM13700M.
----- MISCELLANEOUS -----		
	P29/208M103010	Washer, flat: 3 mm.
	P29/2080113000	Washer, spring: 3 mm.
	P29/6120059000	Heatsink: TO-220.
	P29/2120025001	Rivet, pop: 1/8-inch blind.

PRODUCTION CHANGES

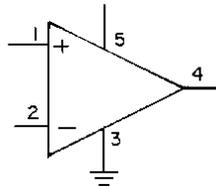
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Rev. A SPEAKER AMP BOARD P29/7720038000 (350A1371P22)
Initial production release.

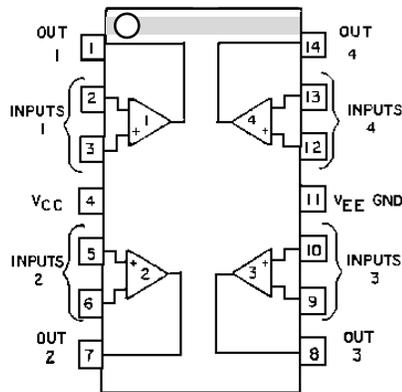
U1 & U2
AUDIO AMPLIFIER
P29/3480091000 (TDA2003H)



PIN IDENTIFICATION (TOP VIEW)

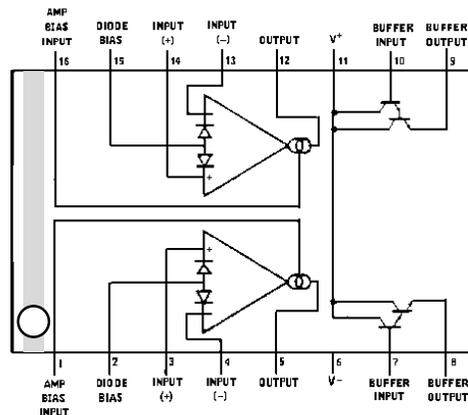


U3
QUAD OP AMP
P29/3480100601 (TL084)



(TOP VIEW)

U4
DUAL TRANSCONDUCTANCE OP AMP
P29/3590091000 (LM13700)



Top View