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D239,537
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INSTALLATION AND SERVICE INSTRUCTIONS FOR

- 288-8L HIGH-FREQUENCY DRIVER
- 288-16L HIGH-FREQUENCY DRIVER
- 290-8L COMPRESSION DRIVER
- 290-16L COMPRESSION DRIVER
- 291-8L HIGH-FREQUENCY DRIVER
- 291-16L HIGH-FREQUENCY DRIVER
- 299-8A HIGH-FREQUENCY DRIVER
- 299-16A HIGH-FREQUENCY DRIVER
- 906-8A HIGH-FREQUENCY DRIVER
- 906-16A HIGH-FREQUENCY DRIVER

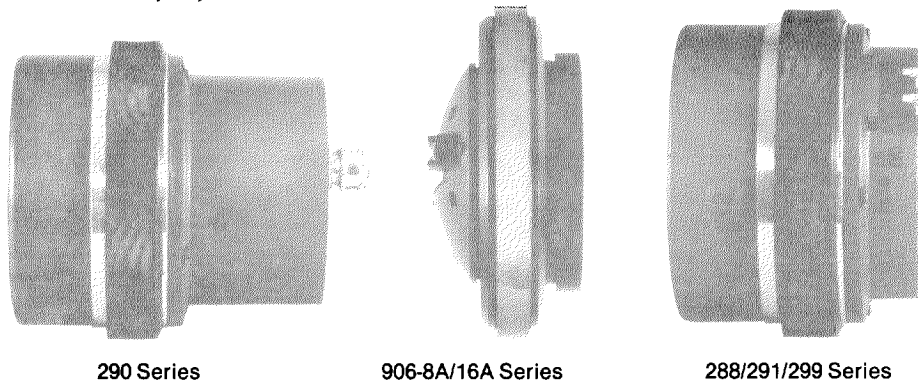


Table I. Gasket Specifications

Gasket No.	Altec No.	O.D.	I.D.	Thickness
1	20466	2"	1.406"	0.016"
3	21270	2"	1.406"	0.125"

NOTE: Gaskets are supplied with adaptors and drivers.

DRIVER INSTALLATION

Figure 1 illustrates the options and configurations for mounting the drivers. Gaskets are supplied where required. The following recommended procedural steps describe the assembly of the horn system and installation of the drivers.

1. Locate the four mounting studs (Altec Lansing part number 28-08-020117) in the hardware kit. This is a 3/8" stud threaded 16 pitch on one end and 24 pitch on the other end, with a short unthreaded segment in the middle.
2. For use with an Altec Lansing horn with three holes in its driver mounting flange, thread the 16-pitch end of three of the studs into the inner circle of tapped holes in the driver casting. See Figure 2A.
3. For use with an Altec Lansing horn with four holes in its driver mounting face, thread the 16-pitch end of the four studs into the outer circle of tapped holes in the driver casting. See Figure 2B.

NOTE

If you are attaching an old Altec Lansing driver (NOT this driver) with only the three-bolt pattern to an Altec Lansing horn with a four-bolt pattern, use the 25544 adapter, which must be ordered separately. Refer to the section for installing the 25544 adapter.

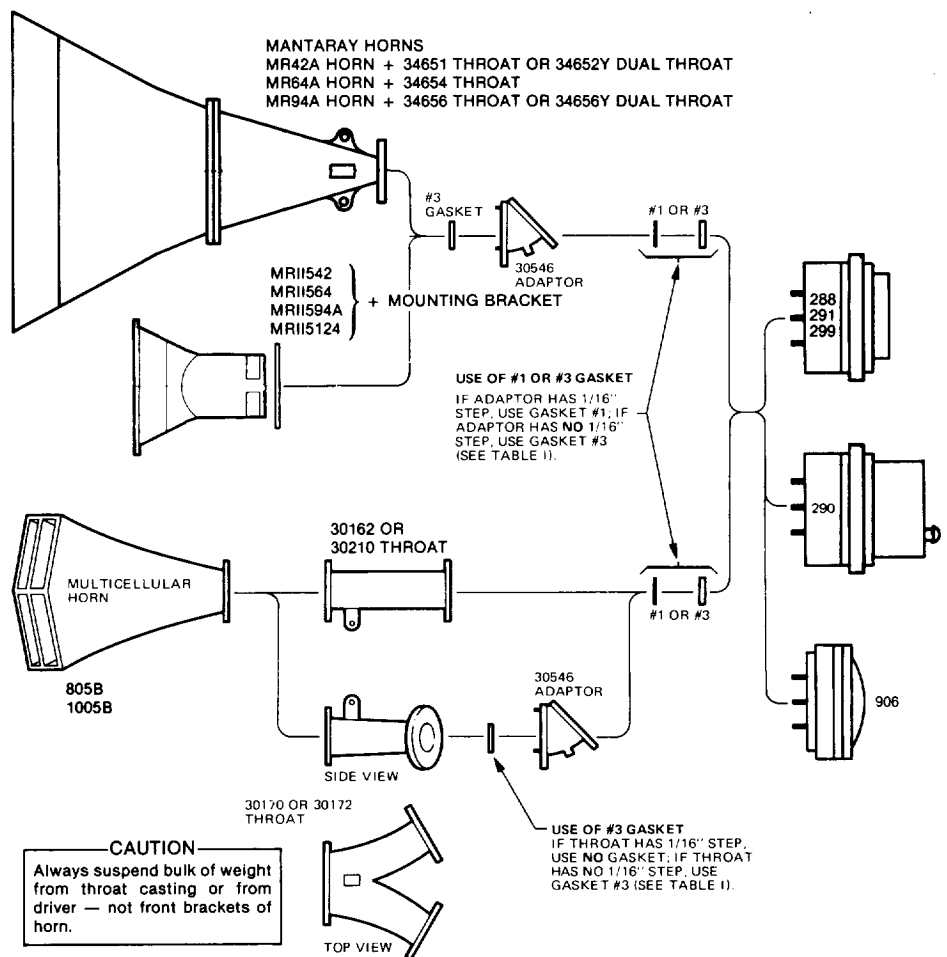
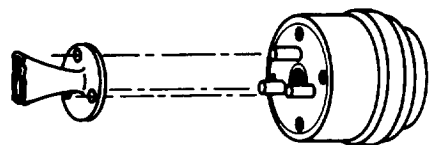
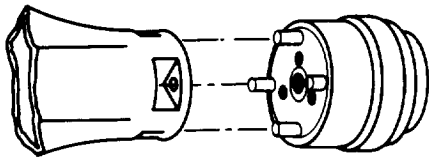


Figure 1. Mounting Options of Drivers



A. Three-stud mounting



B. Four-stud mounting

Figure 2. Installing Mounting Studs on Driver

4. If the threads are stiff, take two of the 3/8"-24 pitch nuts from the hardware kit. Run one all the way to the unthreaded part of the stud, and run the other down until it touches the first nut. Use a wrench on the second nut only, to tighten the studs into the driver casting. Remove the nuts from the stud.
5. Connect throats and/or adaptors to horns with appropriate bolts, lockwashers and nuts supplied. Tighten all nuts evenly. Install #3 gaskets (see Table I) *only* where required:
 - a. Use a #3 gasket in connecting an adaptor to a sectoral horn (see Table I).
 - b. Use a #3 gasket in connecting an adaptor or throat that has a flat face with *no raised 1/16" step* (see Table I).
6. Install driver, using either a #1 or #3 gasket. If adaptor or throat has 1/16" raised step, use gasket #1; if adaptor or throat has a flat face with *no raised step*, use gasket #3 (see Table I).

NOTE

If 290 series driver is to be installed with an internally mounted transformer, install transformer before installing driver. Refer to section on TRANSFORMER INSTALLATION WITHIN 290 SERIES DRIVERS in these instructions.

7. Secure driver to adaptor or throat with lockwashers and nuts provided. Tighten all nuts evenly.
8. Connect transformer output (or power amplifier output) leads to driver. Be sure to observe proper polarity and correct output impedance of transformer or power amplifier. Figures 3 and 4 illustrate output impedance of Altec 15480 and 15065 transformers. Table II shows wiring connections. Driver impedances are as follows:

288-8L	8 ohms
288-16L	16 ohms
290-8L	8 ohms
290-16L	16 ohms
291-8L	8 ohms
291-16L	16 ohms
299-8A	8 ohms
299-16A	16 ohms
906-8A	8 ohms
906-16A	16 ohms

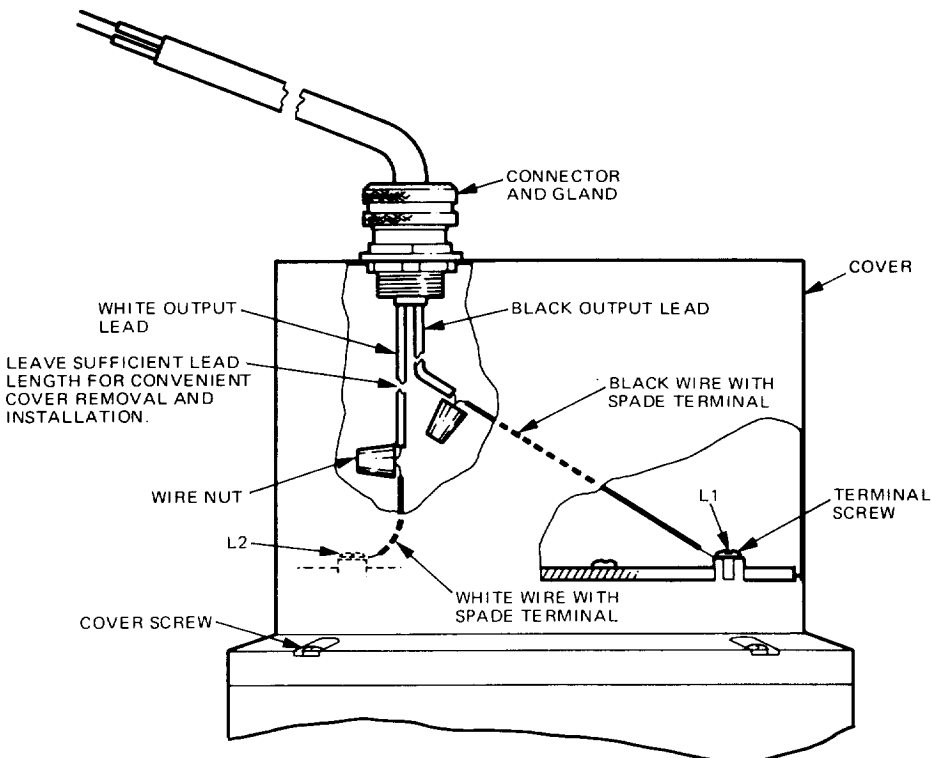


Figure 5. Wire Connections for 290 Series

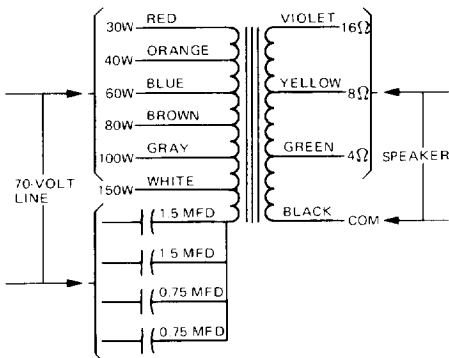


Figure 3. Altec 15480 Transformer Wiring

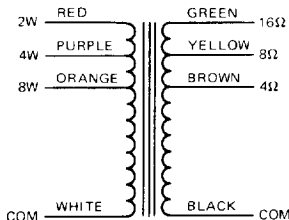


Figure 4. Altec 15065 Transformer Wiring

To connect output leads to 290 series, refer to details of Figure 5:

- a. Remove screws securing cover and lift off cover and gasket.
- b. Pass output leads through rubber gland of connector, through driver cover. Leave sufficient lead length (approximately 18 inches) to facilitate installation and tighten connector to seal gland.
- c. Connect stripped ends of black and white wires to output leads, using wire nuts.

Table II. Connections — 15480

Desired Power (watts)	Lead Color	Low Frequency Cutoff (Hz)	Capacitors Used
100	Gray	450	All
80	Brown	500	2 large, 1 small
80	Brown	350	All
60	Blue	500	2 large
60	Blue	300	All
40	Orange	500	1 large, 1 small
40	Orange	300	2 large
30	Red	300	1 large, 1 small

- d. Connect spade terminal of black wire to L1 with terminal screw; connect spade terminal of white wire to L2 with terminal screw.

NOTE

Black wire (L1) is negative (-) and white wire (L2) is positive (+). Positive voltage on L2 produces positive wave front at throat of driver.

- e. Install gasket and cover. Secure with screws removed in Step 4a.

25544 ADAPTER ASSEMBLY INSTALLATION

These instructions apply to the assembly of Altec Lansing 288-type, 290-type, and 291-type drivers with three mounting studs onto Altec Lansing horns with four mounting holes.

Hardware Kit Parts List

Altec Part Number	Description	Quantity
28-05-124348	bolt, 3/8"-16, 5/8"	3
28-02-109735	hex nut, 3/8"-24	1
28-03-109728	lockwasher	4

1. Remove the three mounting studs (Altec Lansing part number 28-08-020117) from the driver. Retain the three 3/8"-24 pitch hex nuts and lockwashers, as these will be required later. The mounting studs may be removed with vicegrip pliers on the unthreaded part of the stud. Alternately, thread one of the hex nuts, one of the lockwashers, and another hex nut on the stud. Use a wrench on the inner nut to remove the entire stud from the driver. Repeat for the other two studs, and remove the nuts and lockwasher.
2. Locate the three hex head 3/8"-16 pitch, 5/8" long bolts in the 25544 adapter hardware kit.
3. Place the 25544 adapter assembly over the mounting face of the driver so that the three bolt holes in the adapter line up with the three threaded holes in the driver.
4. Place one of the lockwashers (removed earlier) on each bolt and thread each bolt through the adapter and into the driver. Tighten firmly with a 9/16" nut driver.
5. Place the driver-adapter combination on the horn.
6. Slide the four lockwashers from the 25544 hardware kit over the four studs that fit from the adapter into the horn.
7. Using the three hex nuts removed from the driver and the one additional hex nut from the 25544 hardware kit, thread a nut onto each of the four mounting studs, and tighten.

TRANSFORMER INSTALLATION WITHIN 290 SERIES DRIVERS

1. Remove screws securing driver cover (see Figure 6); lift off cover and gasket. Do not loosen or remove gland fitting from cover.
2. Align transformer with appropriate mounting holes in driver; secure with screws supplied. Figure 5 illustrates a typical transformer installed.
3. Insert cable (2-conductor type SV or equal) through connector and gland, and connect to selected 70-volt line wires (see Figure 3 or 4).
4. Connect correct transformer leads to driver leads, using wire nuts. Figures 3 and 4 illustrate impedances and power ratings of Altec 15480 and 15065 transformers.
5. Insulate end of each unused wire with tape or wire nut.

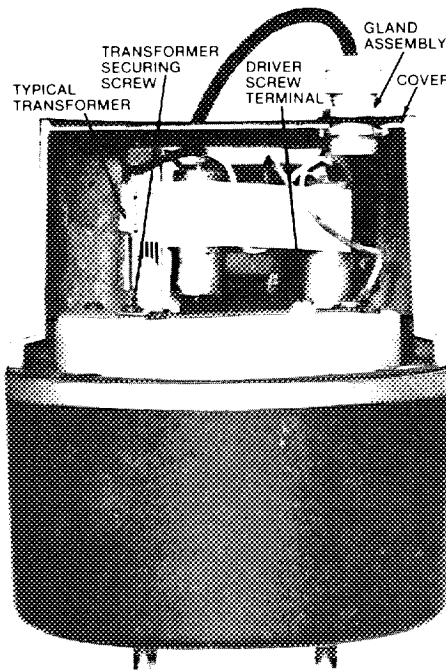


Figure 6. Altec 290 Series Driver with Typical Transformer Installed

6. Install gasket and driver cover, securing with screws removed in Step 1.

PROTECTION FROM RF AND STATIC CHARGES

The 70-volt lines leading to outdoor speaker installations may develop a substantial voltage to ground at radio frequencies, due to the proximity of high-power radio and radar transmitting stations. Ungrounded speaker lines are also subject to accumulated static charges under atmospheric conditions. A discharge in the voice coil gap, from either of these causes, may be prevented by the following means; such means are recommended whenever the speakers are mounted on an insulated support (e.g., a telephone pole or wooden tower).

1. *When the 70-volt line is 'floating'* (i.e., no ground connection exists at either side of the amplifier output to the speaker line):

Two 0.005 μ F, 200-volt ceramic capacitors should be connected from each side of the 70-volt transformer primary (mounted inside the driver cover) to the driver housing so as to bypass the 70-volt speaker line to the frame of the horn/driver assembly (see Figure 7). An accessible connection point is usually found under the mounting screws of the 70-volt transformer. The 70-volt line to each speaker array should be bypassed in this manner at one horn/driver assembly in the array. A wire, 12 gauge or larger, should be connected between each driver housing or horn frame in the speaker array. After the horn/driver assemblies are interconnected in this manner, a single wire of 12 gauge or larger should be run from the driver assembly in the speaker array to a solid earth ground — such as a water pipe. A 10,000-ohm resistor

should then be connected between one of the 70-volt output terminals and ground at the amplifier output (see Figure 8).

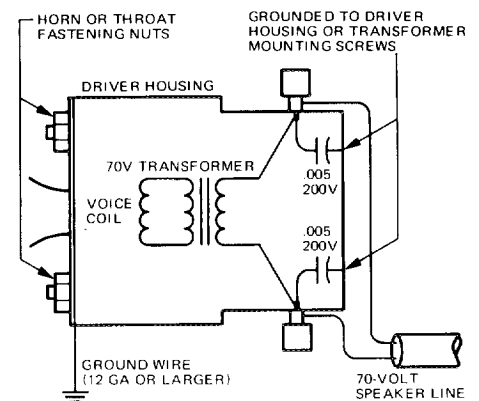


Figure 7. Preventing Damage from RF and Static Charges

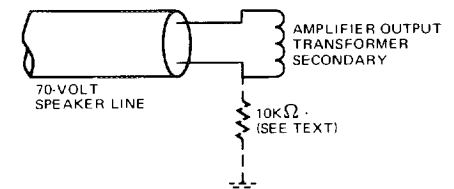


Figure 8. Grounding 70-Volt Output Terminal

2. *When the 70-volt speaker line is already grounded at the amplifier output:*

The preceding instructions continue to apply, with regard to the RF bypass within the speaker housing itself and the grounding of the horn frame or driver housing of each horn; however, the 10,000-ohm resistor at the amplifier location may be omitted.

POWER-HANDLING CAPABILITY

Altec rates the power-handling capability of drivers in terms of *continuous power capacity*. Pink noise (constant energy per octave) is used as a test signal throughout the frequency response range of the driver because it represents an accurate indication of the heating capacity of the driver. Because this test signal includes a 6 dB crest factor, it is also an indication of the driver's transient power handling capacity. Watt of power capacity are measured on the basis of voltage squared divided by minimum impedance.

Table III lists the continuous powerhandling capacity and the band-limited pink noise spectrum (frequency response range or bandwidth) for the various drivers.

High-pass filters should be used for all systems that might be subjected to power demands at frequencies below the low-frequency power rating limit of the driver. Live reinforcement of modern music *requires* the use of a high-pass filter if rated power capacities are to be realized, due to the presence of significant subsonic and extreme low-frequency energy.

Table III. Continuous (Pink Noise) Power Ratings for Altec Drivers

Power	Rated Power Bandwidth in Hertz	Watts (E x 1) of Continuous Power Capacity
288-8L	500 — 20,000	20
288-16L	500 — 20,000	20
291-8L	500 — 20,000	50
291-16L	500 — 20,000	50
290-8L	300 — 10,000	120
290-16L	300 — 10,000	120
299-8A	500 — 20,000	50
299-16A	500 — 20,000	50
906-8A	500 — 20,000	40
906-16A	500 — 20,000	40

For two-way systems divided at 500 or 800 Hz, approximately one-half of the available power (of full-range program material) is delivered to the driver, and one-half to the low-frequency component. When combining elements in systems, a reasonable assumption is that system powerhandling capacity for program material should be predicated on the percentage of the input signal that would be imposed on the weakest element of the system, typically the HF driver. In addition, if attenuation of the driver signal is required to match sensitivity with the low-frequency component, powerhandling capacity of the driver is increased by the amount of attenuation employed.

For system applications, refer to Altec Technical Letter No. 230, "Application of Component Loudspeaker Power Capacity Ratings to the Design of Two-Way Systems."

DIAPHRAGM AND VOICE COIL REPLACEMENT FOR 288, 290, 291, AND 299

The diaphragm and voice coil assembly in HF drivers is extremely delicate and must be handled with care. Prior to starting the replacement procedure, select a work area that is clean and free from dust or chips. Cover the surface with a few layers of clean paper. The area must be free from drafts to prevent iron dust particles in suspension from being magnetically attracted to and lodged in the voice coil gap of the HF driver. Replace the diaphragm and voice coil assembly in accordance with the following procedure.

1. Remove leads from external binding posts, noting electrical phasing (polarity) as leads are removed (288, 291, and 299 drivers). For 290 driver, disconnect cable.
2. As appropriate to installation, remove driver and/or horn from enclosures or mounting, and take removed assembly to prepared work area.

NOTE
Where easy access to driver is available, replacement procedure may be completed without removing driver and/or horn from mounting or enclosure.

3. Remove screws securing driver cover and carefully lift cover for access to interior as shown in Figure 9. The 290 driver is equipped with a covering transformer mounting plate, with or without transformer, as applicable.

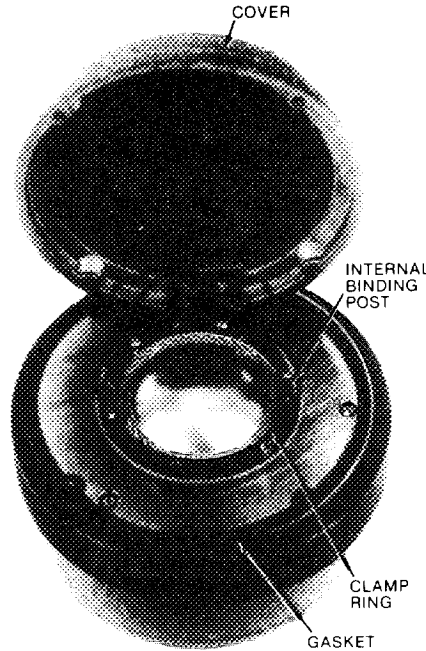


Figure 9. Typical Driver with Cover Open

4. Disconnect two leads from internal binding posts (288, 291, and 299 drivers) and set cover aside. For 290 driver, remove four screws securing transformer mounting plate; lift off plate and set cover and transformer/plate assembly aside.

CAUTION: THE DIAPHRAGM IS EXTREMELY DELICATE. USE CARE TO PREVENT DAMAGE. AVOID PHYSICAL CONTACT WITH DIAPHRAGM. KEEP SCREWDRIVER AWAY, AS STRONG MAGNETIC FIELD MAY ATTRACT SCREWDRIVER INTO DIAPHRAGM.

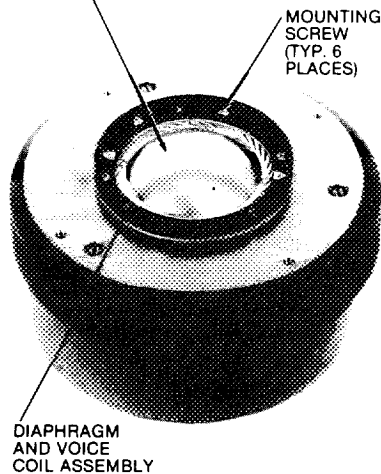


Figure 10. Diaphragm and Voice Coil Assembly Installed in Driver

CAUTION
The diaphragm is extremely delicate. Use care to prevent damage. Avoid physical contact with diaphragm. Keep screwdriver away, as strong magnetic field may attract screwdriver into diaphragm.

5. Remove six screws securing diaphragm and voice coil assembly to driver. Carefully work diaphragm and voice coil assembly free from dowel locating pins and remove assembly (see Figure 10).
6. Clean foreign material from voice coil gap with a short strip of masking tape 1-inch wide. Fold tape to form a strip with adhesive exposed on both sides. Insert edges of folded tape into gap to full depth, and wipe clean completely around circular perimeter (see Figure 11). Repeat cleaning procedure with fresh tape until tape is clean when withdrawn. Visually inspect magnetic gap to make sure it is free of foreign matter; repeat cleaning procedure as required.

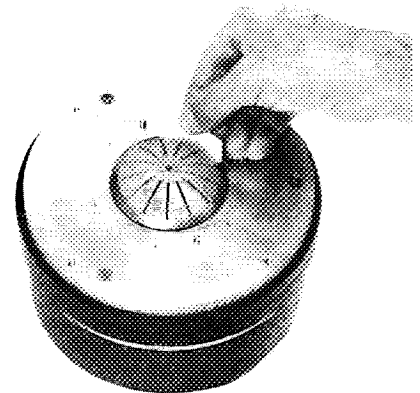


Figure 11. Cleaning Voice Coil Gap

7. Loosen securing screw of each of two adjustable dowel locating pins until pins move freely (see Figure 12).
8. Insert spider shim into voice coil gap as shown in Figure 13. Shim No. 14-20-023963 is supplied with replacement diaphragm and voice coil assembly.

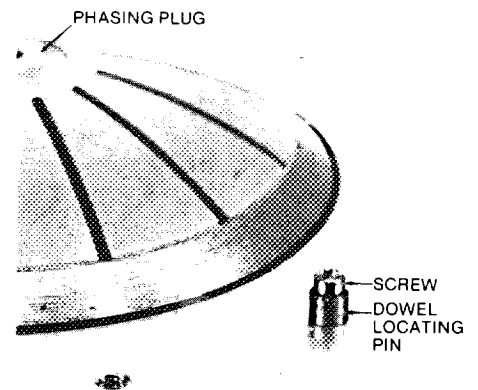


Figure 12. Adjustable Dowel Locating Pin

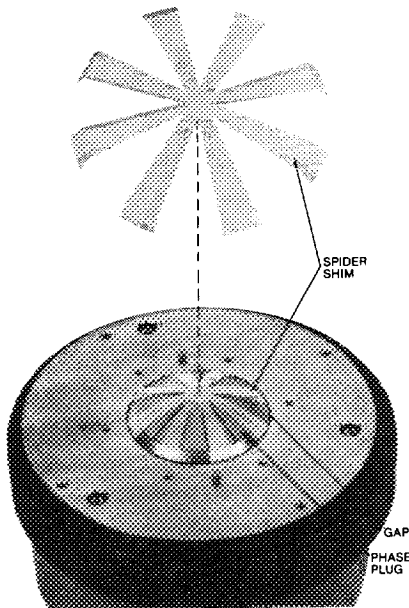


Figure 13. Spider Shim Installed into Voice Coil Gap

9. Carefully place new diaphragm and voice coil assembly on dowel locating pins. *Do not* install diaphragm screws at this time. Use care to avoid damaging edge and sides of voice coil while inserting it into voice coil gap, between shim and vertical side of top plate. The shim sets the voice coil into the precise position, while the free locating pins move to accommodate the slight adjustment needed to properly align the voice coil in the gap.
10. With new diaphragm and voice coil assembly fully inserted into position, tighten each securing screw of two dowel locating pins. This correctly centers the diaphragm and voice coil assembly.
11. Remove diaphragm and voice coil assembly.
12. Remove spider shim from gap.
13. Carefully reinstall diaphragm and voice coil assembly; install six securing screws removed in Step 5. Exercise cautions noted in Step 4 and Figure 10 in accomplishing this procedure.
14. Connect two leads of driver cover to internal binding posts (288 and 291 drivers), with red lead to post L2 and black lead to post L1. For 290 driver, position transformer/plate assembly on driver and secure with four screws removed in Step 4; then connect cable wire leads to internal terminal screws as shown in Figure 5, with black wire to terminal screw L1 and white wire to terminal screw L2.

NOTE

Be sure gasket is set in position, as shown in Figure 8, prior to connecting driver leads.

15. Install cover of driver, securing with screws removed in Step 3.
16. Return driver to service; connect external leads to binding posts according to phasing (polarity) noted in Step 1 (288 and 291 drivers). For 290 driver, reconnect cable with wire nuts as shown in Figure 5.

DIAPHRAGM AND VOICE COIL REPLACEMENT FOR 906-8A

The diaphragm and voice coil assembly in HF drivers is extremely delicate and must be handled with care. Prior to starting the replacement procedure, select a work area that is clean and free from dust or chips. Cover the surface with a few layers of clean paper. The area must be free from drafts to prevent iron dust particles in suspension from being magnetically attracted to and lodged in the voice coil gap of the HF driver. Replace the diaphragm and voice coil assembly in accordance with the following procedure.

1. Disconnect the leads from the input terminals on the driver's rear cover, noting electrical polarity as the leads are removed.
2. As appropriate to the installation, remove the driver and/or the horn from the enclosure or the mounting, and take the removed assembly to the prepared work area. Where easy access to the driver is available, the replacement procedure may be completed without removing the driver and/or horn.
3. Remove the six screws securing the combination rear cover and diaphragm-voice coil assembly to the driver. Note the orientation of the (+) and (-) terminals. Carefully remove the assembly by lifting evenly on each side until it clears the two internal tapered dowel pins. The rear cover and diaphragm-voice coil assembly will come off as a unit, and are to be replaced as a unit.

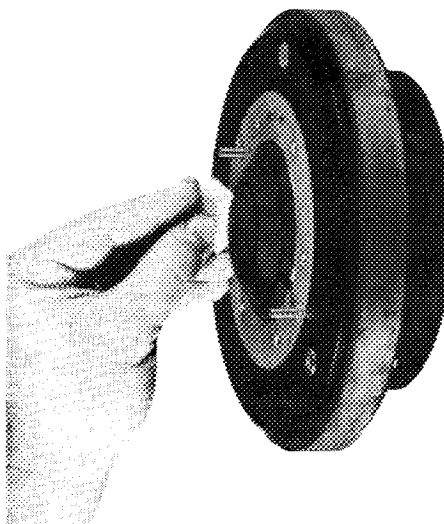


Figure 14. Cleaning Voice Coil Gap

4. Clean foreign material from the voice coil gap using the method shown in Figure 11, above.

5. Take the new combination rear cover and diaphragm assembly out of its shipping carton and carefully remove the protective plastic cover from the bottom of the assembly.
6. Orient the combination rear cover and diaphragm assembly with the (+) and (-) terminals as they were with the assembly which was just removed, and push lightly and evenly into position, sliding the appropriate holes onto the tapered dowel pins.
7. Install the six securing screws removed in step 3, above, tightening them evenly.
8. Return the driver to service, connecting the leads from the crossover network or amplifier with the same polarity noted in step 1, above.