



MOTOROLA

Service Manual

AUTO RADIO

MODEL
VWM60

GENERAL INFORMATION

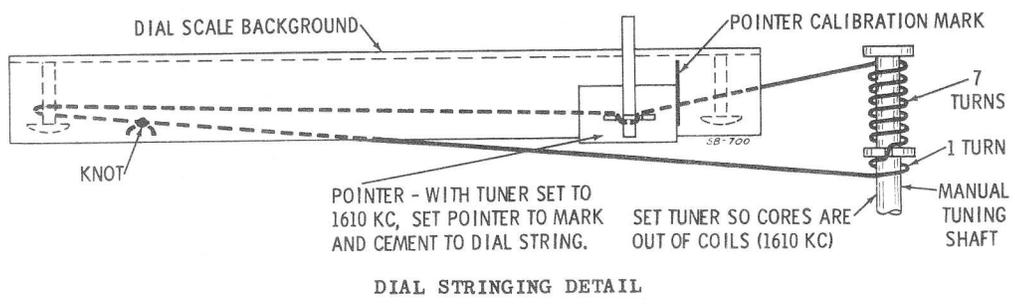
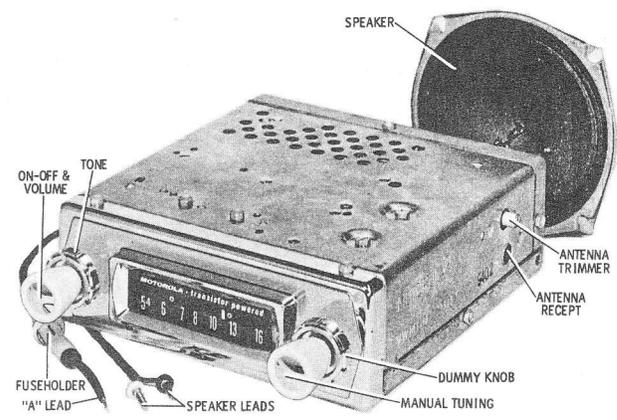
TYPE - Automotive type 6 volt superheterodyne receiver designed for custom installation in 1960 Volkswagon cars. This receiver contains a transistor output stage, a transistor power oscillator (for B+ supply), and four miniature tubes.

TUNING RANGE - 540 to 1610 Kc **IF** - 262.5 Kc

OPERATES FROM - 6 volt storage battery (negative ground)

TUBE AND TRANSISTOR COMPLEMENT

	6BE6	Conv
	6BA6	IF amp
	6CR6	Det-AVC-AF amp
	6BF6	Driver
	MN-73	
or	2N176	Transistor pwr amp
	MN-73	
or	2N176	Transistor pwr osc (for B+ supply)



MOTOROLA AUTO RADIO WARRANTY SERVICE STATION PROCEDURE FOR BRANDED MODELS

1. The definition of a Motorola Branded Model is one that is branded with the Motorola name, and distributed to dealers through authorized Motorola Distributors.
2. Before performing a warranty repair on a Motorola Branded Auto Radio, you must first receive from the customer the Customer's Warranty Policy. This policy must be filled in by the selling dealer at the time of retail purchase. The Customer's Warranty Policy must show the radio to be within the ninety-day warranty period if the repair is to be handled under the Motorola Auto Radio Warranty Plan.
3. The removal or reinstallation of the radio, the elimination of motor noise, tire static, electrical interference, or faulty installation and aerial repairs are not considered as warranty repairs. Consequently, charges for these serv-

- ices are to be borne by the customer.
4. Fill in the Motorola Auto Radio Warranty Labor Claim, Part No. 54P480884, and mail white and green copies to the Motorola Distributor serving your area. The yellow copy is to be retained by the Warranty Service Station for his files.
5. Defective parts for warranty repairs made on Motorola Branded Auto Radios are to be sent to your Motorola Distributor for free replacement, supported with the defective parts return form which you are now using.
6. Only those service shops authorized by their Motorola Distributor can perform repairs within the warranty period on a no-charge basis to the customer. If you are not already authorized as a Motorola Auto Radio Warranty Service Station, and you are interested in handling this service, please contact your Motorola Distributor for complete details.

SERVICE NOTES

1. RADIO POLARITY - WHEN SERVICING THIS RECEIVER, THE "A" LEAD MUST BE CONNECTED TO THE POSITIVE SIDE OF THE POWER SOURCE. IF CONNECTED OTHERWISE, RECEIVER WILL NOT OPERATE AND DAMAGE TO COMPONENTS MAY RESULT.
2. POWER SUPPLY REQUIREMENTS - It is preferable to use a storage battery (without a battery charger) in place of a battery eliminator. If a battery eliminator is used, it must be well regulated and filtered.
3. POWER TRANSISTOR REPLACEMENT - When replacing

- a power transistor, be sure transistor insulator is in place and well greased and that the mounting screws are securely and evenly tightened. Use only the transistor specified in the Replacement Parts List for replacement. See Notes 4 & 5.
4. POWER TRANSISTOR INSULATOR - When replacing a power transistor or power transistor insulator, be sure to coat both sides of insulator with DC-4 grease (Motorola Part No. 11M490487) to insure proper heat dissipation.
5. POWER TRANSISTOR CURRENT ADJUSTMENT - After a power transistor has been replaced, the collector current

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should be checked and adjusted for proper operation.

a. Insert a low range (0-1 or 0-2 amp) DC ammeter in the primary ground return lead of the output transformer (T4). Connect the negative post of the meter to ground. (see Schematic).

b. Turn the radio on and allow it to heat up for about 15 minutes.

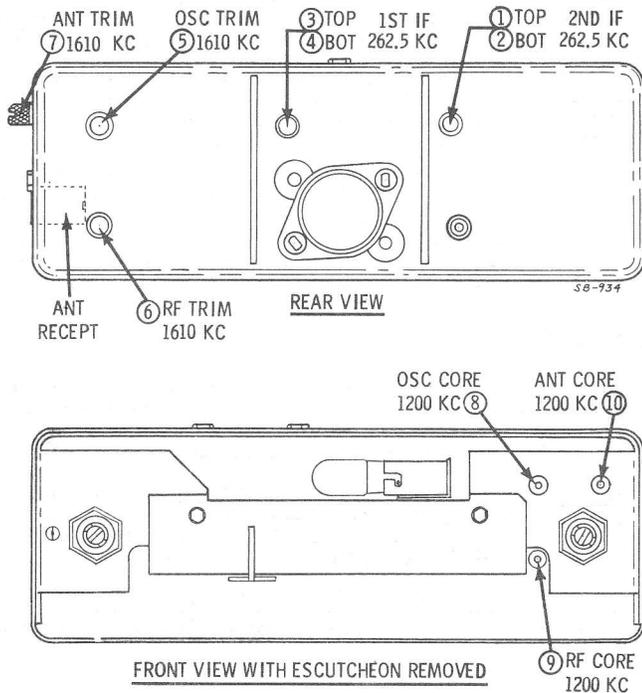
c. Adjust R13 for a reading of 560 ma with 6.3 volts input to the radio "A" lead.

NOTE: Two values of radio input voltage are given as a convenience to service personnel in order to accommodate different power sources. The current value stated on the Schematic Diagram is for 7 volts input to the radio "A" lead.

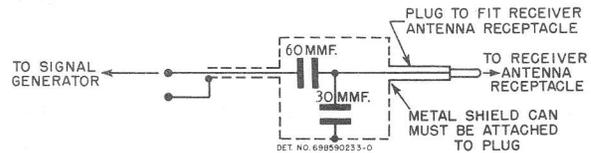
ALIGNMENT

Connect an output meter across the speaker voice coil. Set volume control to maximum. Attenuate signal generator output to maintain 1.79 volts on output meter at all times to prevent overloading receiver.

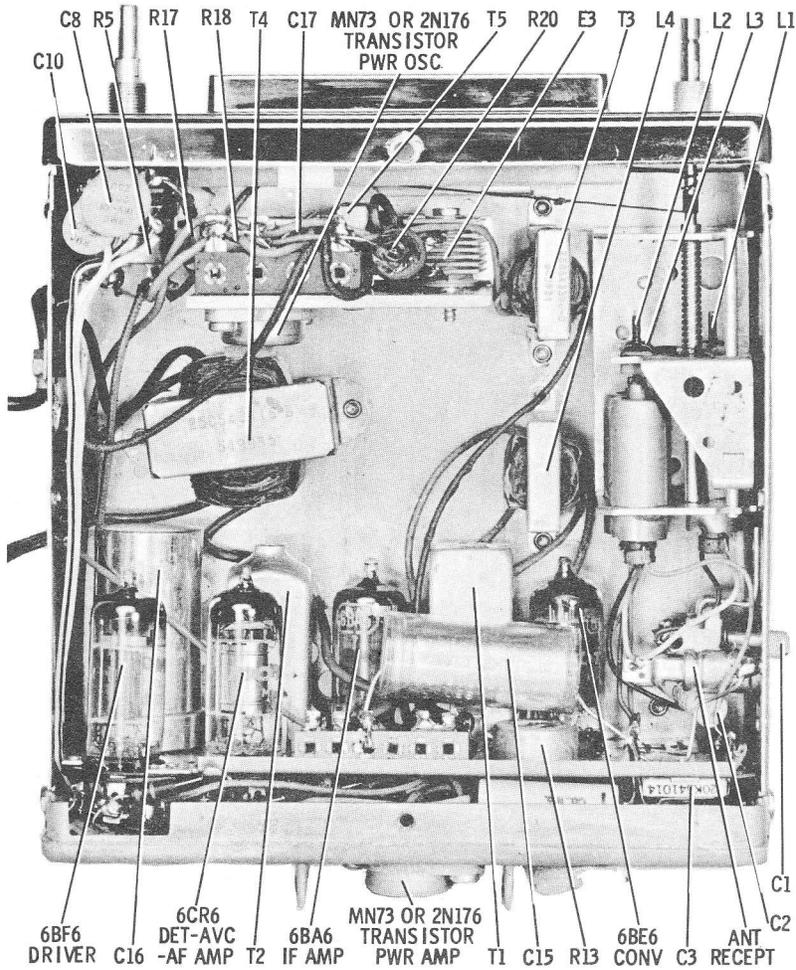
STEP	GENERATOR CONNECTION	GENERATOR FREQUENCY (400 cycle mod)	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT					
1.	Ant recept thru .1 mf & chassis	262.5 Kc	Hi end stop	1, 2, 3 & 4	Adjust for maximum.
RF ALIGNMENT					
2.	Ant recept thru dummy (see fig)	1610 Kc	Hi end stop	5, 6 & 7	Adjust for maximum.
NOTE: Do not perform steps 3, 4, 5 & 6 unless the tuner has been tampered with or components have been replaced. Before proceeding with step 3, back tuning cores as far as possible out of coils to minimize their effect on trimmer adjustments.					
3.	Ant recept thru dummy (see fig)	1610 Kc	Hi end stop	5, 6 & 7	Adjust for maximum.
4.	"	1200 Kc	Tuner carriage 9/32" from hi end stop	8, 9 & 10	Adjust for maximum.
5.	"	1610 Kc	Hi end stop	5, 6 & 7	Adjust for maximum.
6. Repeat steps 4 & 5 until no further increase, then cement tuning cores in place; step 5 should be last adjustment.					
ANTENNA TRIMMER					
7.	-	-	Weak station around 1400 Kc	7	With radio installed in car and antenna fully extended, adjust antenna trimmer for maximum.



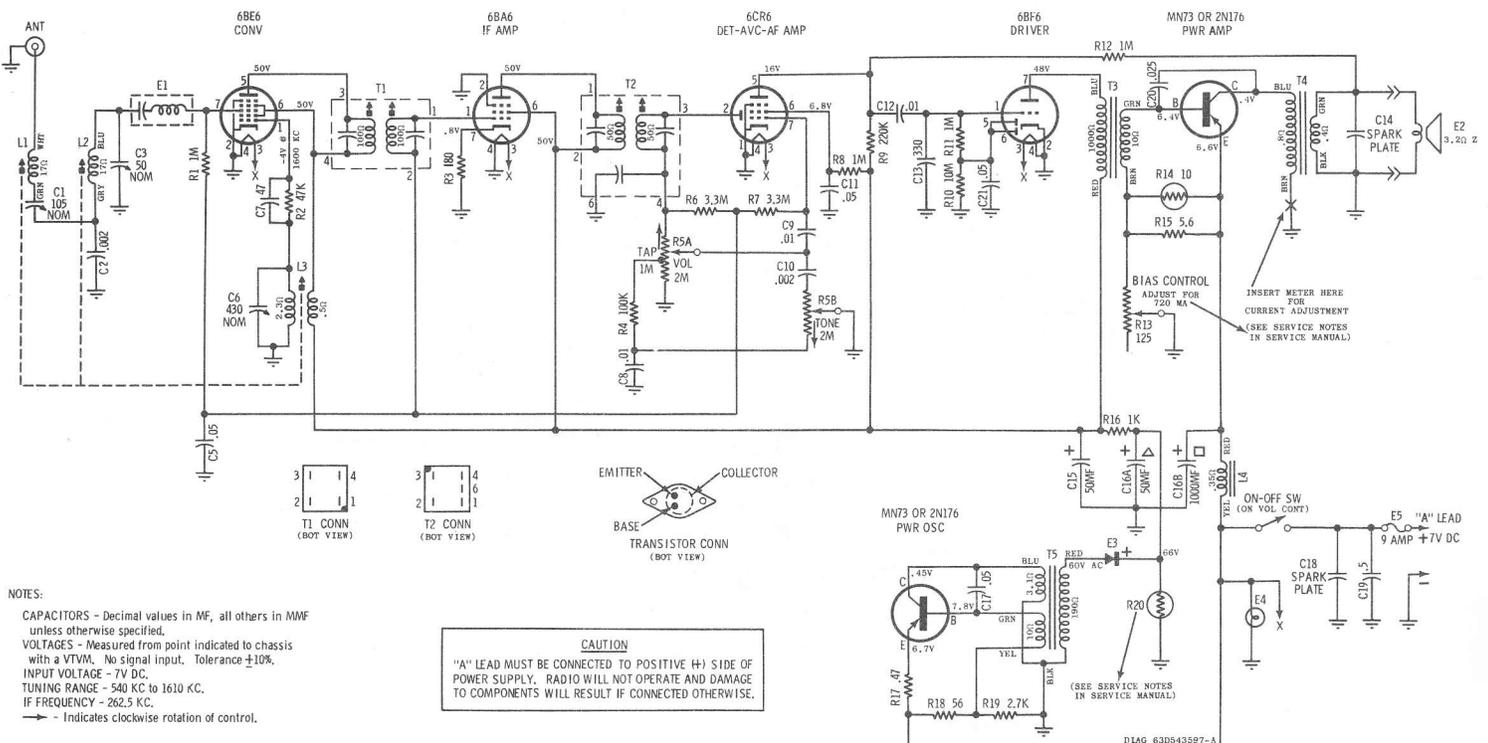
ALIGNMENT LOCATIONS



DUMMY ANTENNA



PARTS LOCATION



SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part. Electronic parts of equivalent rating are not necessarily of equivalent standards. The components listed in this Service Manual have been chosen for reliability and applicability to the specific circuits involved. For maximum customer satisfaction and minimized call-backs, use the exact Motorola parts replacement.

Ref. No.	Part Number	Description
ELECTRICAL PARTS		
C-1	20B544017	Capacitor, mica trim: 40 mmf to 430 mmf (incl brkt)
C-2	8R122291	Capacitor, paper tub: .002 mf 1000V
C-3	20K541014	Capacitor, mica trim: 20 mmf to 120 mmf
C-5	8R121005	Capacitor, paper tub: .05 mf 200V
C-6	20A485708	Capacitor, mica trim: 395 mmf to 470 mmf
C-7	21R115593	Capacitor, cer disc: 47 mmf 500V
C-8	21R482726	Capacitor, cer disc: .01 mf 500V
C-9	21R122789	Capacitor, cer disc: .01 mf 500V
C-10	21R125165	Capacitor, cer disc: .002 mf 500V
C-11	21A542384	Capacitor, cer disc: .05 mf 50V
C-12	21R482726	Capacitor, cer disc: .01 mf 500V
C-13	21R410118	Capacitor, cer disc: 330 mmf 500V
C-14	64K530177	Spark Plate: 1 x 1-3/8
C-15	23B543394	Capacitor, electrolytic: 50/150V
C-16	23B543393	Capacitor, electrolytic: 50/150V-1000/4V
C-17	21A542384	Capacitor, cer disc: .05 mf 50V
C-18	64K530177	Spark Plate: 1 x 1-3/8
C-19	8K122076	Capacitor, paper tub: .5 mf 100V
C-20	21K740806	Capacitor, cer disc: .025 MF 200V
C-21	21A542384	Capacitor, cer disc: .05 MF 50V

E-1	24K539955	Choke, ant spark
E-2	50C543225	Speaker, PM: 5"; 3.2Ω VC
E-3	48K543405	Rectifier, selenium
E-4	65R10867	Bulb, dial light: 6V; #44
E-5	65R16248	Fuse, 9 amp

L-1, 2, & 3	See Tuner Parts List
L-4	25B543396 Choke, filter

Resistors - Note: All resistors are insulated carbon type, unless otherwise specified.

R-1	6K122324	1 meg 20% 1/2W
R-2	6K121687	47,000 20% 1/2W
R-3	6K128952	180 10% 1/2W
R-4	6K122313	100,000 20% 1/2W
R-5	18K544000	Control, dual & switch: R5A Vol 2M; R5B Tone 2M
R-6	6K119407	3.3 meg 20% 1/2W
R-7	6K119407	3.3 meg 20% 1/2W
R-8	6K122324	1 meg 20% 1/2W
R-9	6R6015	220,000 20% 1/2W
R-10	6K119408	10 meg 20% 1/2W
R-11	6K122324	1 meg 20% 1/2W
R-12	6K122324	1 meg 20% 1/2W
R-13	18K542493	Bias Control: 125
R-14	6K543800	Thermistor: 10@ 25°C
R-15	6A488139	5.6 10% 1W
R-16	6K127960	1000 20% 1/2W
R-17	17K488266	Wirewound: .47 10% 1/2W
R-18	6R5614	56 10% 1/2W
R-19	6K119926	2700 10% 1/2W
R-20	6A543419	Varistor, special

T-1	24B543286	Transformer, 1st IF: 262.5 Kc
T-2	24K543287	Transformer, 2nd IF: 262.5 Kc
T-3	25B543386	Transformer, driver
T-4	25C543416	Transformer, output
T-5	25C543395	Transformer, pwr osc
48C124246	Transistor, Type 2N176: PNP junction (pwr amp & pwr osc)	

Ref. No.	Part Number	Description
48A124332		Transistor, Type MN73: PNP junction (pwr amp & pwr osc)

MECHANICAL PARTS

43K543285	Bushing, mtg (manual tuning shaft)
42B733793	Clip, IF mtg
15K543815	Cover, bottom
13D543242	Escutcheon, chrome
14A543810	Insulator, transistor
2S7051	Nut, hex: 3/8-32 (vol & bushing mtg)
7B543267	Plate, dial scale ret
1K543277	Pointer
9K541991	Receptacle, fuse
5K13896	Rivet, shoulder
34B543390	Scale, dial
3K560695	Screw, tapping: 6-20 x 1/2 (trans mtg)
3S129994	Screw, tapping: 6-20 x 1 (rect mtg)
1V543435	Slider, pointer: incl rivets
9A472148	Socket, antenna
9K543387	Socket, pilot light
9K539132	Socket, tube: 7 pin min
9B542339	Socket, 2 pin (transistor)
2S7087	Speednut, dial scale ret

MOUNTING PARTS & ACCESSORIES

64B543874	Bracket, radio mtg (front)
7A543889	Bracket, radio mtg (rear)
8B538244	Condenser, generator
8A4491	Condenser, noise suppression
32B543887	Gasket
36K542005	Knob, dummy
36B522020	Knob, tone
36K542973	Knob, tuning & vol
2S1376	Nut, hex: 3/8-32 (radio mtg)
3S128062	Screw, tapping: #10 x 3/8 (spkr mtg)
6A4141	Suppressor, noise
1V544037	Trimplate, chrome (incl rubber tubing)
4K481689	Washer, felt (knobs)

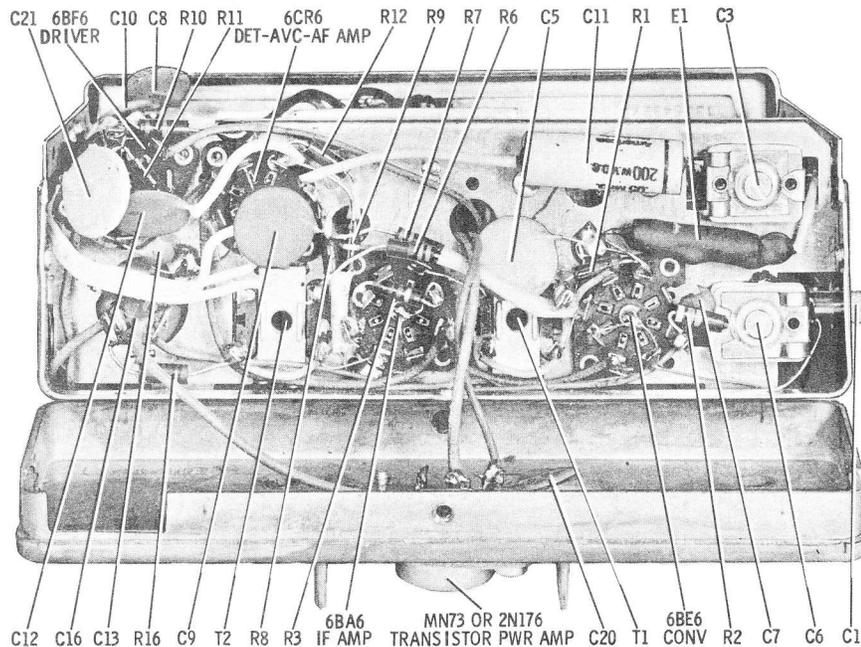
TUNER 77K563073 (MT-300) PARTS

L-1	24K562246	Coil, antenna
L-2	24K562245	Coil, RF
L-3	24K562244	Coil, osc
	77K563073	Tuner, MT-300; complete
	76K536535	Core, iron
	76K560447	Core, iron
	5A533933	Grommet, core mtg
	2B533929	Nut, tension drive
	22K534525	Pin, roll (tuning shaft)
	47K563075	Shaft, manual tuning
	26A535533	Sleeve, iron (ant & RF coil)
	26A535534	Sleeve, iron (osc coil)
	41B536529	Spring, retaining (tuning shaft)

LIMITED REPLACEMENT PARTS

Note: The volume of replacement on the following parts is small, consequently, it is suggested that ordering be done only as required.

1V544042	Cover, rear: incl trans socket
1V544036	Kit, radio mtg parts



PARTS LOCATION