

# THE MOTOROLA SERVICE NEWS

Nov. - Dec., 1954

## MOTOROLA, COLOR TV

IN THIS ISSUE WE ARE FEATURING "SERVICE NOTES" ON THE MOTOROLA, COLOR TV RECEIVER. THIS IS A CONTINUATION OF THE COLOR TV DISCUSSION STARTED IN OUR SEPTEMBER-OCTOBER 1954 ISSUE OF THE MOTOROLA SERVICE NEWS

### SERVICE NOTES Motorola, Color TV (TS-902)

#### CHANGING OF TUBES

(Refer to TS-902 horizontal chassis top view and BP-902 vertical chassis top view for tube locations.) (See Figs. 11 & 14).

The receiver should be turned off when changing tubes. Indiscriminate changing or interchanging of tubes should be avoided for the following reasons:

1. A change of IF or RF tube, or crystal detector, can cause loss of sensitivity or poor picture quality. Check alignment and sensitivity after making such changes.
2. A change of limiter or ratio detector tubes can cause distorted audio, buzz, or loss of audio sensitivity. Check alignment and sensitivity after changing these tubes.
3. Changing the horizontal oscillator tube can result in poor noise rejection or cause the horizontal hold control to be out of range. This may necessitate re-adjustment of the horizontal oscillator coil.

#### FUSE REPLACEMENT

B plus and initial surge fuse (special 7.5 ohm resistor R-73)

This fuse is a plug-in type located on the top rear of the horizontal chassis, behind the vertical chassis. It is possible to replace this fuse by removing the back cover. Replacement is facilitated, however, by removing the four bolts from the baseboard and shifting the receiver assembly toward the rear of the cabinet.

Filament fuse (1 inch of #26 copper wire)

This fuse is located beneath the chassis in the area below the filament transformer. The chassis must be removed from the cabinet in order to replace the filament fuse. Replace with a 1 inch length of #26 wire soldered between two lugs of the terminal strip; the connection is in series with the heavy green lead from the filament transformer.

#### HORIZONTAL OSCILLATOR ADJUSTMENT

The HORIZONTAL HOLD control should have a sync range of approximately 25 degrees rotation. If the control adjustment is overly critical:

1. Increase the BRIGHTNESS and reduce the HORIZONTAL SIZE until the edges of the horizontal blanking pulse (grey vertical bars) are visible on either side of the raster.
2. Shunt the HORIZONTAL OSCILLATOR coil L-43 to ground with a .25 mf 400V, capacitor, and ground the control grid of the horizontal oscillator (pin 4).
3. Adjust the HORIZONTAL HOLD control until the picture is in sync or slowly floating through sync.
4. Remove the capacitor shunting L-43 to ground and adjust the HORIZONTAL OSCILLATOR coil until the picture is again in sync or floating through sync.
5. Remove short from control grid (pin 4) of horizontal oscillator.

#### REMOVAL OF THE CHASSIS

The chassis and the picture tube are mounted independently to a baseboard which is bolted into the cabinet. The chassis may be removed from the cabinet independently of the picture tube by removing four bolts. When removing only the chassis; disconnect the ground lead between the high voltage cage and the picture tube; disconnect the high voltage lead; disconnect antenna lead-in and unplug speaker plug; unplug the deflection yoke plug from chassis; disconnect yoke leads extending into the high voltage case; on models using a field neutralizing coil, unplug the field neutralizing coil plug.

Both the picture tube and the chassis can be removed by removing the four bolts which hold the baseboard to the cabinet. This operation must include the removal of the antenna from the side of the cabinet, disconnecting the antenna lead-in, unplugging the speaker plug and removing the wire braid from the bezel.

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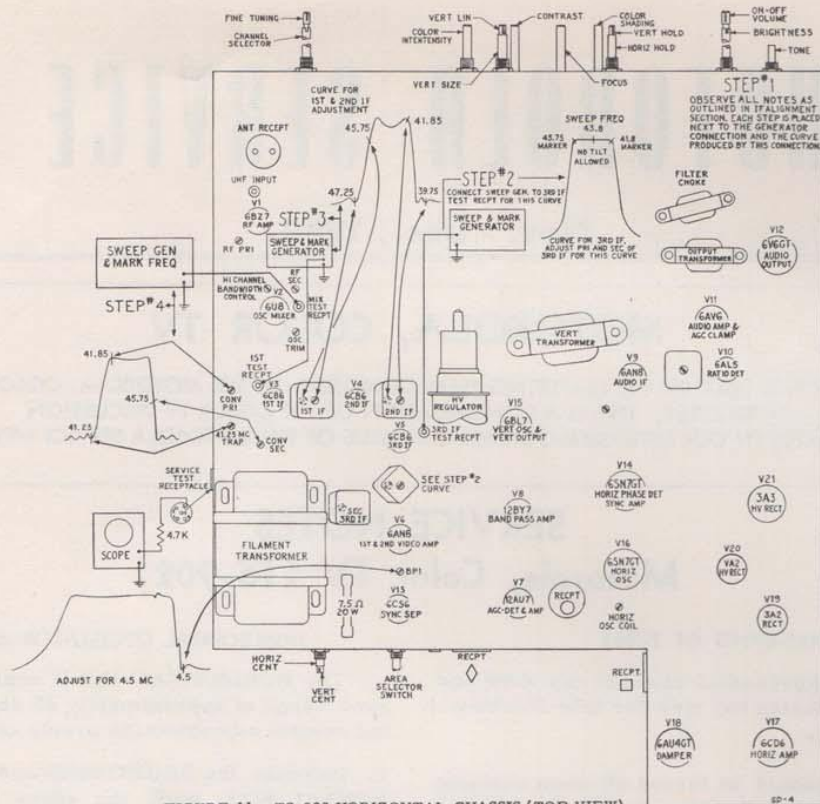


FIGURE 11. TS-902 HORIZONTAL CHASSIS (TOP VIEW)

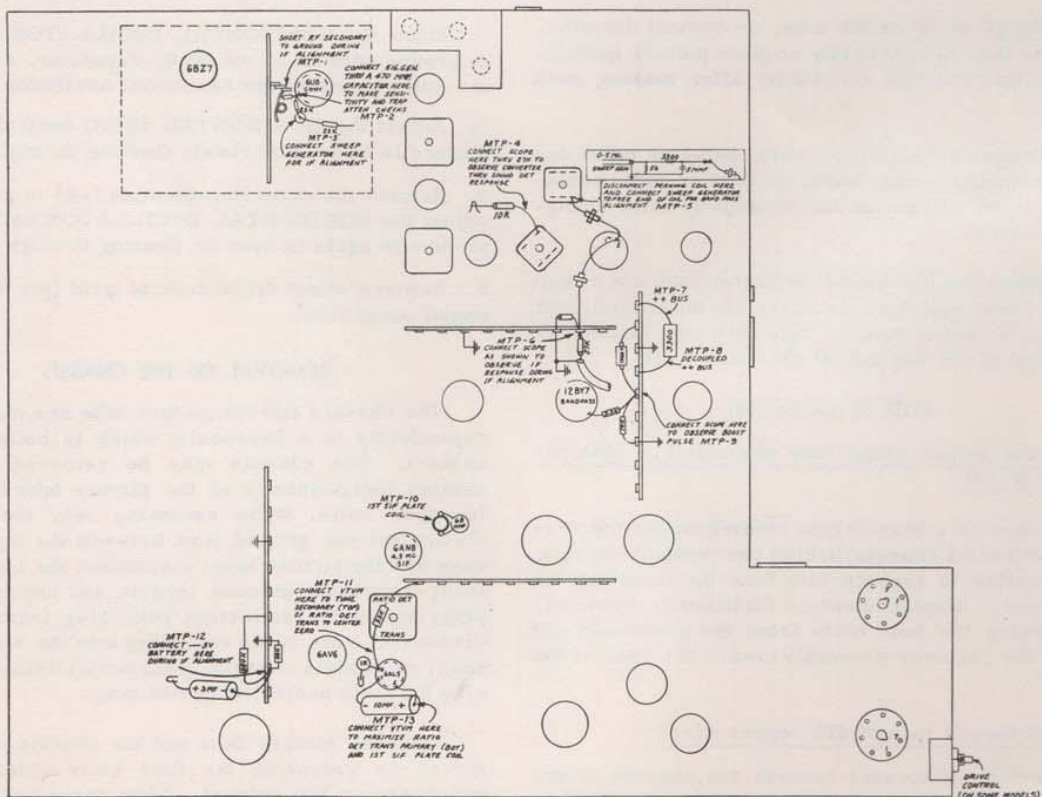


FIGURE 12. TS-902 HORIZONTAL CHASSIS (BOTTOM VIEW)

Note: Figure #1 and #14, shown in September-October issue.

## TONE CONTROL LINKAGE SETTING

In the event it becomes necessary to replace the tone control linkage:

1. Turn the tone control maximum counterclockwise.
2. Place the linkage over the TONE and CONTRAST-VOLUME shafts in such a manner that the arms and link are above the shafts.
3. Move the linkage assembly counterclockwise as far as possible.

NOTE: After chassis has been replaced in the cabinet, place the TONE control knob over the CONTRAST - VOLUME shaft so that the lettering on the knob is toward the top.

## REMOVAL AND REPLACEMENT OF COLOR PICTURE TUBE

Replacement of the tri-color picture tube necessitates a complete purity and convergence alignment.

### To remove the color picture tube:

1. Disconnect the picture tube sockets. (Refer to Fig. 1).
2. Remove the blue lateral corrector magnet.
3. Remove the PM purity device.
4. Withdraw the dynamic convergence coils from the neck of the tube by shifting the coil lever toward a vertical position.
5. Remove the fibre picture tube mounting strap.
6. Disconnect the plastic high voltage interlock.
7. Loosen connecting rods between front and rear tube supports.
8. Remove front picture tube retaining brackets. Carefully remove the picture tube out the front of the

assembly. Use extreme care while pulling the neck of the picture tube through the dynamic convergence coil assembly and the yoke.

9. Remove the magnetic shield from the flare of the picture tube.
10. Remove plastic insulating sleeve from around tube; remove second anode connector.

### To install color picture tube:

1. Before installing tube in chassis mounts, clip second anode connector on metal flange of picture tube. Make this connection at a position approximately in line with pin #12 of the picture tube.
2. Place plastic insulating sleeve around picture tube front. Sleeve fold-over should be positioned in line with pin #4 of the picture tube.
3. Place magnetic shield on flare of the tube.
4. Mount picture tube to chassis with pin #4 toward top. Replace the front tube - retaining brackets. Position tube so that plastic sleeve over picture tube face edge is flush against retaining brackets.
5. Replace fibre picture tube strap; tighten connecting rods between front and rear tube supports; connect high voltage interlock.
6. Replace the PM purity device.
7. Replace the blue lateral corrector magnet so that it is directly below the blue gun and then replace tube socket.
8. Move the dynamic convergence coils in close proximity to the tube neck by shifting the dynamic convergence coil lever toward the tuner side of chassis.
9. Proceed with a complete purity and convergence alignment and background tracking set-up.

## TUBULAR CAPACITOR IMPROVEMENTS

Consistent with Motorola's policy of maintaining the highest quality in the performance of all its electronic equipment, another significant step has been taken that will go a long way toward maintaining this quality.

Some years ago, Motorola decided to undertake factual studies to determine what might be done to improve the quality of tubular capacitors. This work was put in motion and from it was found these facts.

Heretofore, these components were made with a paper dielectric, and mounted in paper tubular cases containing a wax or oil impregnation. The Industry, in an attempt to improve upon the quality of these components replaced paper cases by various type molded bakelite cases, in a semi-molded and plastic-seal processing and even by glass and ceramic cases.

From a performance point of view, all of these variously cased capacitors were placed in two classifications, based primarily on maximum operating temperatures of 65 and 85 degrees centigrade.

Motorola's studies found that the maximum operating temperature check was not the prime factor in establishing the merit of these units. Rather, adequate insulation resistance under humidity. (Freedom from moisture absorption) and method used in testing longevity of the units, proved most important.

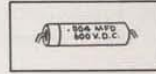
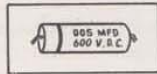
With this knowledge, Motorola undertook to establish a new class of permium performance capacitors which would meet new, higher, and more rigid requirements than previously thought possible.

This work has been completed and from it has developed what is known as Motorola as "Class C" capacitors.

These new type capacitors are ceramic jacketed and all use highly durable end seal material. All features are specifically designed to meet the new rigid heat and humidity tests for an extended period of time with voltage applied.

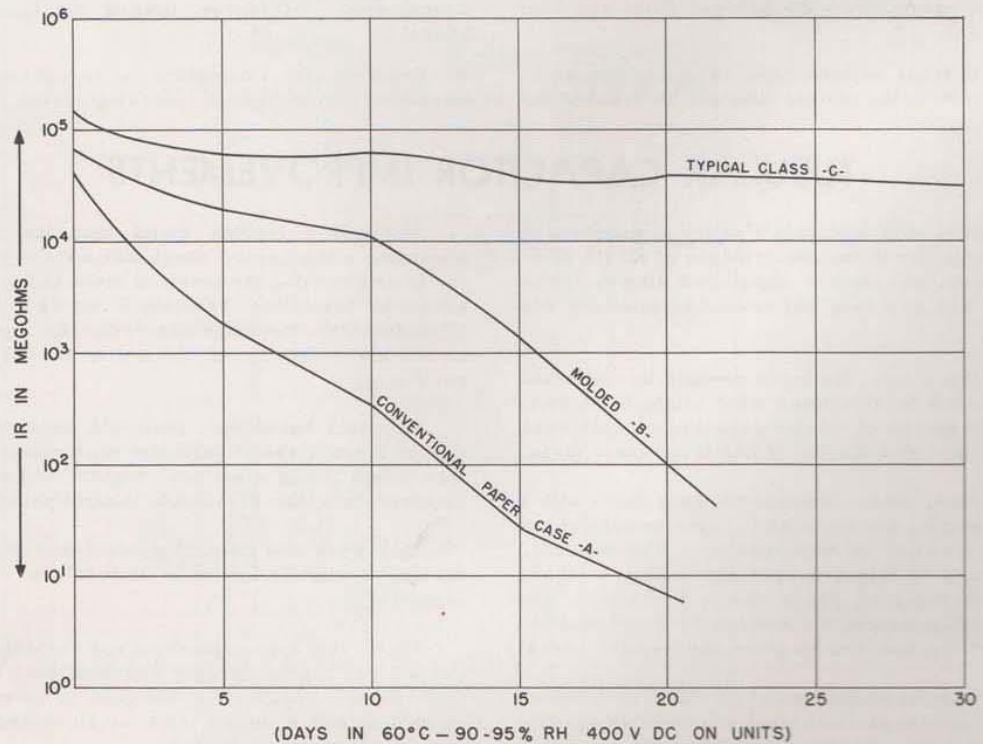
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## THE A, B, C's OF DESIGN IMPROVEMENTS IN PAPER TUBULAR CAPACITORS



CHARACTERISTICS	-A- CONVENTIONAL PAPER CASE	-B- MOLDED PHENOLIC CASE	-C- CLASS "C" CERAMIC CASE	COMPARATIVE INS. RES. AFTER 15 DAYS AT 60°C, 90-95% W. V. APPLIED	
	1 APPEARANCE	POOR	GOOD	GOOD	CLASS A (.05-200V)
2 MARKING READABILITY	POOR	FAIR	EXCEL	CLASS B "	1000 MEGS
3 END SEAL "POP-OUTS"	HIGH	NONE	NONE	CLASS C "	10,000 MEGS
4 IMPREGNATION DRIPPING	HIGH	SOME	SOME	COMPARATIVE TESTLIFE (65°C, 90-95% RH - 400V DC)	
5 INS. RES. CHANGE vs HUMIDITY	HIGH	SOME	NIL	CLASS A (.05-400V)	4 DAYS
6 SERVICE LIFE EXPECTANCY	POOR	GOOD	EXCEL	CLASS B "	14 DAYS
7 SHELF LIFE	POOR	GOOD	EXCEL	CLASS C "	30+ DAYS
8 BULK FACTOR (SIZE VS CAP.)	GOOD	FAIR	GOOD	COMPARATIVE LIFE EXPECTANCY IN ACTUAL SERVICE	
9 COST FACTOR (QUALITY VS PRICE)	POOR	FAIR	EXCEL	CLASS A ANY STD. VALUE	1 UNIT
				CLASS B " " "	3-1/2 UNITS
				CLASS C " " "	7-1/2+ UNITS

### PROOF OF CLASS C SUPERIOR PERFORMANCE



The advantages of the new class over previously available types are numerous. Among them are:

1. Greater service life expectancy
2. Lower insulation resistance change versus humidity
3. Excellent shelf life
4. Improved marking readability
5. Reduction of End-Seal Pop-outs

In addition, these improvements have not resulted in any increase of physical size versus capacity value or list price. This information is outlined in Figures 1 and 2.

Motorola has been using these capacitors in its Home and Auto Radio and Television Receivers for a considerable period of time. From date of original use to now, close watch has been kept of any field breakdowns of these new units. The results have been very gratifying. Breakdowns have been almost non-existent.

We are happy to pass this information on to the Service Industry and strongly recommend the use of these units as replacements in all electronic equipment. Stocks of representative values and working voltages may be obtained from your Motorola Distributor.

## SERVICE HINTS

Set: TS-902 (Color-TV, Chassis)

Indication: Washed out picture. Very poor low frequency response. Horizontal sync effected but still holding. Vertical sync very poor and erratic.

Trouble Found: 300uh peaking coil L-38 in video amplifier V6A (1/2-6AN8) grid circuit, was open.

Remedy: Resoldered fine wire of peaking coil, L-38.

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Set: TS-602 Chassis.

Indication: Picture was very weak with area selector switch in local position, normal in suburban and would overload in fringe position.

Trouble Found: R-82 (10K) resistor had changed in value to a 15K causing incorrect AGC voltage. This resistor feeds cathode of pulsed AGC tube 12AU7 (V-11B). Note: If normal AGC voltages were not known, the trouble could have been suspected as being in the tuner, IF, crystal, or AGC.

Remedy: Replaced R-82 with resistor of proper value.

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Set: TS-410A Chassis.

Indication: Picture pulling, buzz in audio, sound in picture, vertical tends to roll, and horizontal tends to slip.

Trouble Found: #C-95, 200 and 5 mfd, 150V filter, found open. (Bridging another across located the trouble).

Remedy: Change #C-95 filter capacitor.

Note: Thanks to Mr. Walter Gromek of Charlotte, Michigan for this service hint.

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Set: WTS-518A-00, TS-402, TS-502, TS-505, TS-507, and TS-524C-00 Chassis.

Indications: Vertical distortion at high levels of contrast.

Trouble Found: Vertical non-linearity caused by the presence of video information in the grid circuit of the vertical amplifier of some of the subject sets under high contrast settings.

Recommend Corrections: To eliminate this condition, where found, it is recommended that you try changing the coupling condenser from 5000 MMF to 1500 MMF. In the WTS-518A-00 this is #C-93. In the other above mentioned chassis the identification is #C-117.

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Mr. A. Paolucci of Binghamton, New York reports two service hints, as follows:

Sets: TS-602 Chassis.

Indication: Buzz in sound and sync is unstable.

Trouble Found: Poor ground between case and mounting bracket of #C-50.

Remedy: Install ground wire between #C-50 ground terminal and chassis ground.

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Set: TS-502 Chassis.

Indication: Distorted sound and picture size varies with audio.

Trouble Found: Shorted #C-56C reducing bias on 1st audio amplifier causing tube to cut-off and draw excessive current.

Remedy: Replace #C-56 capacitor.

Note: Thank you Mr. Paolucci.

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### AUTO RADIO - SEARCH TUNER

SUBJECT: MoPar Models 900 & 901 Search Tuner Service Notes.

The search tuners depend wholly on the fact that they should be operated in an area which contains listenable radio signals. Areas such as steel garages, steel bridges or any other such shielded locations will prevent the tuner from operating satisfactorily. The tuner may re-cycle continuously without stopping on station. Check type of signals available by tuning across the entire frequency range

manually. A check should be made to see that the antenna trimmer is correctly adjusted, that the antenna is at least half-way extended or that the sensitivity control is not set to a low sensitivity position.

The 3-position sensitivity control is located above the search selector bar:

Left - low sensitivity for extremely strong signal areas.

Center - medium sensitivity for average signal areas.

Right - high sensitivity for weak signal areas.

If the tuner continuously stops at the low frequency end of the dial on the return cycle (including pushbutton operation) even after the service manual trouble shooting section has been consulted, check the value of resistors R-13, R-30, R-31 and R-32 against the schematic diagram. If they differ from the schematic, revise accordingly. (Remember, this is not intermittent condition. It is normal for the tuner to stop occasionally on noise, interference or radiated oscillations.)

The Model 900 installed in Dodge cars will sometimes re-cycle, without stopping on station, because the search selector bar is wedged against the instrument panel. This can be adjusted without removing the radio from the car by bending the search selector bar down.

On MoPar Models 833 (Dodge) 834 (DeSoto), 836 (Plymouth), 900 (Dodge) and 901 (DeSoto), provisions are made for a rear seat speaker. The rear seat speaker is plugged into a speaker receptacle on the rear of the radio. If no rear seat speaker is used, the circuit is completed via a shorting bar. When a radio which has a rear seat speaker is serviced, be sure that a shorting bar is inserted into the speaker receptacle; without this bar, the radio will not have audio output.

When servicing or testing any search tuner radio, be sure to use a power supply of adequate current capacity, connected through heavy leads to the radio. A poor battery or power supply will cause the radio to operate improperly.

## VITAL WARRANTY NEWS

We believe the editorial, "Warranty Cards are Birth Certificates", by Marvin Joyner appearing in the October 1954 issue of "Modern Times" is the most timely and honest discussion of the warranty problem and its importance, that we have had the pleasure of reading. May we suggest that you call this editorial to the attention of your dealers sales managers.

**"Warranty Cards Are Birth Certificates"**  
by Marvin Joyner (Reproduced by permission).

A lot of people have learned in the past few years, that just being born is not enough -- you have to prove, specifically, that you are who you claim to be, by a document called a Birth Certificate.

To those of us who have had trouble in obtaining these little gems of proof that we exist, is a full understanding and appreciation of their value.

After receiving mine a few years ago, I spent another tiresome four weeks convincing authorities that a 200 pound, twenty-five year old man, with three children, shouldn't be called "Baby Joyner".

You wouldn't like it if someone went to the State Capitol -- stole the proof that you are you, and left you to argue the rest of your days that you actually are, who you think you 'wuz' Confusing?

No more confusing than why an intelligent dealer, attempting to render an intelligent service to his community, will deliberately cheat and rob HIS CUSTOMER OF HIS BIRTHRIGHT by not properly executing the warranty card that the Manufacturer so carefully places with the product.

You could slap your customer in the 'kisser' just as he signs the Contract and actually do him a better

service than not filling in his warranty card.

You could hardly expect to keep a customer or customers with the slapping practice, and to cut him loose with no identification on the product he buys, is even more ridiculous.

It always amazed me during the war to see a line of several hundred naked men taking a physical. I hate to deflate the egotism that some men may have but there wasn't enough distinctive 'characteristics' in the lot, to tell one from another. Possibly wives, sweethearts or mothers could select her boy from the group, but they all looked alike to me.

If you have watched a production line 'whacking' out hundreds of identical products and models you can see that it is impossible to determine which one is going to Joe Stalcup in Wapnucka, Oklahoma.

There is only one thing that identifies Joe's product from the thousands of others, and that is the serial number on the product matching the same serial number on the 'birth certificate' warranty card reposing in a distributors' and factories' files.

Seldom a day passes in Oklahoma, that a customer isn't paying, for the second time, for service, or parts, or both.

Can you blame that consumer for being mad at the dealer, the manufacturer and in fact the world.

**STOP STEALING FROM YOUR CUSTOMER!** They don't like it. You are entrusted with the 'birth-right' or 'liferight' of your customers' purchase. Please don't break that trust.

In other words, you'll save yourself a thousand heartaches and headaches by properly registering the merchandise you sell -- please believe me!

## NEWS ITEMS

### MOTOROLA HONORS 800 AT SERVICE-CLUB BANQUET

Eight hundred persons, representing a total of 12,500 years of service at Motorola Inc., were honored on October 30, 1954 at the Company's annual Service Club banquet at the Morrison Hotel, Chicago.

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### MOTOROLA DISTRIBUTOR ADVISORY PANEL

The fourth and final in the first years series of distributor advisory panels was concluded by Motorola, Inc. on November 1 and 2.

These advisory meetings between distributor principals and company executives are held away from the factory in a Chicago hotel so that the sessions can be held without distraction or interruption.

Mr. E. R. Taylor, Vice President and Assistant to the President states: "The purpose of these meetings is to exchange information and ideas".

The panel consists of eight distributor principals plus company executives. The panel membership is on a rotation basis which will eventually permit all distributors to participate.

In a recent letter to all distributors, Mr. Taylor said: "We (at the factory) continue to benefit greatly from these meetings, and urge you (distributors) to submit through any members of the panel any question which you believe will be of general interest".

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### NEW MOTOROLA PLANT FACILITIES

On December 2, 1954, Mr. P. V. Galvin, President of Motorola Inc. announced the purchase of 60,000 square feet of car radio tuner manufacturing facilities from Lee J. Drennan, Inc. in Arcade, New York.

Ever since Mr. Galvin, Motorola's founder-president originated the idea of mass-producing auto

## RETMA - Educational Program

The Radio-Electronics-Television Manufacturers' Association has compiled and made available a complete, industry - approved course designed to upgrade the serviceman. In the following, we have reproduced in part Penny Martin's excellent summary of the RETMA's efforts in "Training Employees Through Technical Sessions". This article appeared in the October 1954 issue of the "Service Management" magazine.

### AIMS OF THE RETMA COURSE

These are the aims of the advanced TV Technicians' Course . . .

To increase the technical skill and proficiency of practicing servicemen by instruction in advanced servicing techniques, using the most modern test equipment and working on the latest model receivers.

To train practicing servicemen in the handling of

radios some 25 years ago, Motorola Inc. has held a dominant position in the industry, and currently is the world's largest independent manufacturer of car radios.

The newly acquired plant, located at 430 Main Street, Arcade, New York, will devote its entire production to supplying the company with car radio tuners.

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### ACHIEVE "BUILT-IN" TELEVISION WITH STOCK UNITS

Built-in television arrangements where the unit must be custom installed in a specially-built wall are expensive and require an inflexible furniture arrangement. Yet many of today's homemakers would like to fit television into some sort of handsome, space-saving wall unit.

This idea has been made possible and logical with the introduction of stock cabinet units that combine, mix, match, and stack into all sorts of "built-in" type arrangements. These stock units, made by several furniture manufacturers, come in all price ranges, furniture finishes, and even in unfinished versions.

Paul Pakan, interior decorator, worked with Geraldine Service, Motorola Inc. research stylist, in putting together this handsome arrangement with a brand new group of units called "Space-Span".

This series can be assembled along any wall, even in a tiny room, to incorporate storage, desk, TV, and shelf space. It is an integrated arrangement, too, and one that will add a note of high style to any room.

You can arrange a wall unit such as this for less than \$150, plus the television receiver. If the television console does not line up perfectly the way this Motorola set does, you can insert furniture glides, available in hardware stores, under the cabinets to raise them.

new developments such as current circuit practices, UHF, etc.

To teach servicemen the principles, practices and benefits gained from good customer relations.

To teach sound, approved business practices in the maintenance and conduct of their shop.

To inculcate the serviceman with the principles and ideals of the ethics of the industry and his profession.

### WHY MORE AND BETTER TECHNICIANS ARE NEEDED

Although most men who were in their 'teens when radio began to grow can remember making their own simple crystal sets -- winding their own coils on oatmeal boxes -- they will remember that the home radio receiver, even in those early days, was a delicate and carefully adjusted scientific miracle --

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Tim Alexander . . . National Service Director  
Russ Hansen . . . Editor

and servicing it was a job for a man who knew his business. It still is, because radio receivers, especially in these days of rising demand for high-fidelity reproduction are complex instruments.

But any good service technician looks on a radio receiver nowadays as child's play, compared with the complexity of television.

Today, a man working in a service shop is in an almost hopeless position in the face of this continuing development. Even if he can hope to learn slowly, by working with such new developments -- even if he can grasp the engineering progress involved with help from the busy men around him -- he cannot hope to keep up with this progress and his own work at the same time.

Meanwhile his chances of growth are small, and his chances of keeping his position in a rapidly moving field may themselves be equally small.

In short, the whole field of service is constantly upgrading its requirements -- its demands for knowledge, experience and skill among service technicians. Apart from the new skills, this demand means a corresponding increase in general educational requirements.

The industry alone cannot hope to operate enough schools to keep these technicians abreast of progress. The problem must be attacked on the community level, if there is to be any hope of improvement. It must be attacked by local dealers and servicemen -- and through local schools.

The industry as a whole stands ready to help community attacks on the problem. The industry is already doing something about it.

#### HOW TO DO IT IN YOUR COMMUNITY

The first step toward establishing such a radio-TV training and upgrading course for service technicians in your community is perhaps the most important step of all. The effective carrying out of this first step will assure the effective operation of the program throughout.

This first step is the setting up of an industry advisory committee, or board. This group is important because its functions are permanent, extending far beyond the initial work of establishing, equipping and staffing the school course.

The advisory board would: 1. Assist local schools in adopting the RETMA course of service technician training; 2. Assist with material procurement; 3. Keep the school acquainted, afterward, with current practices within the service field; 4. Act as program coordinator, to guide training so that it will be best fitted to the current needs of service technicians of the community.

This advisory group should be composed of local men who know the community situation, the school problems, and the service field. Represented on the group should be educators, dealers, distributors and service technicians themselves -- the best available.

This advisory group will have available all possible assistance from the RETMA Service Committee in the establishment and maintenance of the course in the local school.

First, RETMA is establishing and offering to such schools a special teacher-training course, especially designed to produce the kind of teachers needed. This is a long step toward the solution of one of the knottiest problems such schools face.

Servicemen successfully completing courses in these schools will be accredited by the industry as technically competent by industry standards. As new developments make new upgrading necessary, advanced instruction will be added, to make sure that service technicians have every opportunity to maintain their industry accreditation.

#### SUCCESS DEPENDS ON YOUR COMMUNITY EFFORT

The problem is as big as the nation, but for that very reason it is too big to be solved nationally. Every community's view of the service upgrading task will, necessarily, be a different view. Needs vary from city to city, from area to area. A solution that works in one community may need some revision for another.

That is why your specialized local needs must be met locally. No national organization can do the job for you. It must be tackled by local associations with the full backing of the industry. RETMA stands ready to help with advice in every way possible. In the end, your solution of the problem in many communities will mean a national solution.

The RETMA Service Committee feels that local organizations are ideally suited to sponsor this program for the benefit of the servicemen and the entire TV receiver industry in your area. If you are of the opinion that this program merits further consideration by your Association, further details can be had by writing: A. Coumont, Service Coordinator, Radio-Electronics-Television Manufacturers' Association 777 Fourteenth Street, N. W., Washington 5, D. C.