

Solenoid Tuners ST-56 (ST-56 - CR6, ST-56 - FD6 etc.,) are used in 1946 and 1947 Motorola automatic tuning specific auto receivers.

MOTOROLA INC.

Fundamentally, all ST-56 tuners are the same except for the manual tuning shaft, dial cord pulleys and pushbutton switch lead lengths. These variations are brought about by mechanical differences between the specific receivers in which this tuner is used. The receiver model number is included in the tuner model number to identify which specific receiver the tuner will fit, i.e., ST-68-CR7, ST-58-BK6 etc.

This is a 3 gang permeability type tuner operated by a aclencid. Five pre-set and one manual tuning positiona are provided. The frequency range is 535 to 1600 kc. The pre-set positions can be set to any frequency within this range.

The tuner is designed to operate satisfactorily with 4-1/2 to 7.3 volts input. Betore attempting any service work on a tuner that operates too slowly or one that doesn't operate at all, check the battery voltage directly at the receiver spark plate. Normally, this voltage is 6.3 volts. At the moment any pushbutton is passed, the voltage at the spark plate should not drop to less than 4-1/2 volts. If the voltage is less than 4-1/2, it is an indication of poor wiring between the car battery and receiver or a defective car battery.

This tuner depends on "dash-pot" action abbetween the plunger and the solenoid for

proper operation. When the fit between the plunger and solenoid is too tight, the air can't get out fast enough. The result is a slow or sluggish operating tuner. All late production tuners have an adjustable air release in the solenoid end plate. Early production tuners that do not have this adjustable air release and operate sluggishly, due to dash-pot action, should have the solenoid end plate replaced with an end plate having the adjustable air release. Order part number 1X76556.

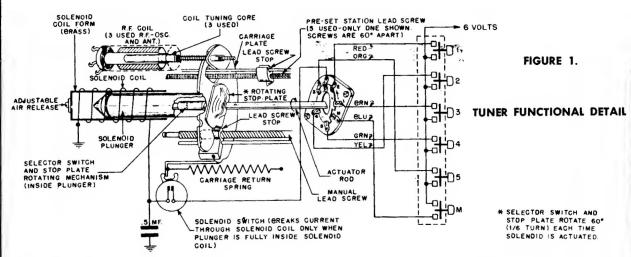
The tuner solenoid coil must be in a horizontal or near horizontal position or the tuner will not operate properly. If it is operated with the coil in a vertical position, the solenoid and carriage return spring may not be strong enough to operate tuner.

#### THEORY OF OPERATION

NOTE: Throughout this paragraph, it is suggested that constant reference be made to Figure 1.

When any push-button is pressed, current flows through the solenoid coil, causing the plunger to pull into the soil. Near the end of the plunger travel, through a ratchet mechanism inside the plunger, the selector switch shaft is rotated  $60^{\circ}$ , moving the selector switch and stop plate to their new position.

An instant later, the solenoid switch is opened breaking solenoid current and the carriage return spring then pulls the plunger out, closing the solenoid switch again. If the selector switch is now resting at the position selected by the push-button (cut away section of selector switch resting in front of contact selected by push-button), the solenoid plunger will continue to be pulled out until the stop plate is resting on the selected lead screw stop. In the event the selector switch



is not resting in the position selected by the push button when the solenoid plunger is on its return trip, the moment the plunger moves out far enough to actuate the solenoid switch, current will again flow through solenoid causing the plunger to be pulled in again. plungers inward motion again rotates the stop plate and selector switch through another 600. This last operation is repeated automatically until the selector swtich comes to rest at the position selected by the push-button, at which time the solenoid circuit is opened and the plunger moves out until the stop plate is resting on the selected lead screw stop. The stops are adjusted to the desired positions during the station setting up procedure, through the set-up gear train assembly.

Refer to Figure 2 for mechanics behind station setting-up mechanism detail.

When the button on which a station is to be set up is first pressed, the tuner operates and the stop plate comes to rest against the selected lead screw stop. The pressure of the stop plate against the lead screw stop moves the lead screw forward until its shoulder rests against the tuner and plate. The square end of the lead screw does not engage in the square hole of the set-up gear until the setup button is pushed in or the station set-up knob is turned (whichever is applicable). A latch on one end of the detent lever engages the gear lever, holding the set-up gear train in contact with the selected lead screw. Now the selected lead screw stop can be moved on its lead screw by turning the manual tuning shaft. None of the other lead screws turn because the stop plate is not resting against After the button is set up, pressing them.

any other button will unlatch the gear lever and disengage the lead screw from the set-up gear. See Figure 2. Since the coil tuning iron cores are attached to the carriage plate and move in unison with the plunger, the point at which they are brought to a stop (by means of the lead screw stop) determines the frequency to which the coils are tuned.

Dash-pot action between the plunger and the solenoid determines the tuner operating speed. The rate at which air is allowed to enter or escape through the adjustable air release determines the speed of the plunger. See Figure 1.

#### TO REMOVE TUNER FROM CHASSIS

Should it become necessary to remove the solenoid tuner from the receiver chassis, proceed as follows:

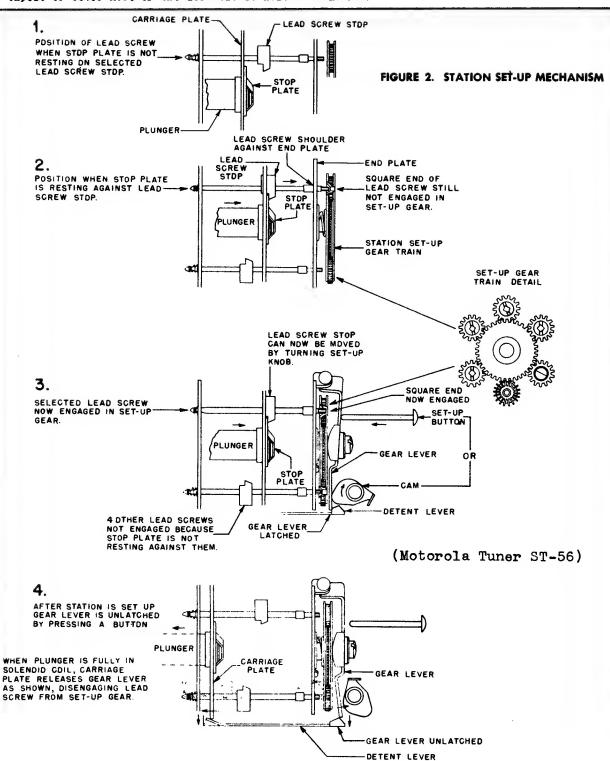
- Remove the covers from the set, tompletely exposing the chassis.
- Mark all leads connecting tuner to receiver.
- 3. Disconnect all leads connecting tuner to receiver. Do not unsolder leads from the tuner selector switch; unsolder them at the push-switch. The .5 mf paper capacitor need not be removed.
- 4. The tuner is held to the chassis by selftapping screws driven into the sides of the tuner. Do not remove any other screws.

The speed at which the tuner operates is governed by dash-pot action of the solenoid plunger within the closed solenoid coil form. The rate at which air is allowed to enter or escape determines the speed of the plunger.

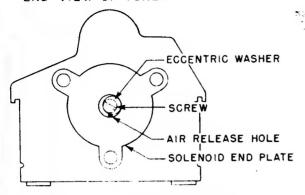
(Motorola Tuner ST-56)

#### AIR RELEASE ADJUSTMENT

An adjustable air release is provided on all late production tuners. See Fig. 3. To adjust, loosen the screw and move the eccentric washer which covers the air release hole to expose or cover more of the air release hole as required. Early production tuners did not have a solenoid end plate with an adjustable air release. If such a tuner is slow or sluggish because of too much "daah-pot" action, replace the solenoid end plate with the adjustable air release type. Order part number 1X76556.



# END VIEW OF TUNER



#### FIGURE 3. AIR RELEASE ADJUSTMENT

- If tuner operates too slowly, open the air release hole. Open it only far enough to secure reliable operation. Too little "dash-pot" action (air release open too much) may cause the plunger to hammer and sometimes even to make the tuner operate continuously due to the selector switch rotor being turned so rapidly as to overshoot its contacts.
- 2. If the tuner operates too rapidly increase dash-pot action by closing the air release hole slightly. Close it only enough to eliminate hammering.

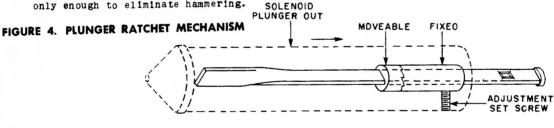
## PLUNGER RATCHET ADJUSTMENT

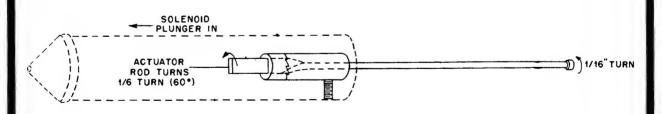
The plunger ratchet mechanism in Figure 4. This mechanism rotates the actuator rod which, in turn, rotates the carriage stop plate and the selector switch 60° for each inward motion of the plunger.

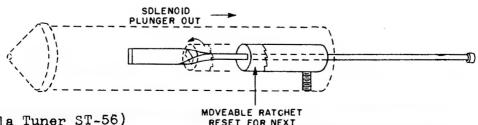
If this adjustment is incorrect, tuner may operate continuously once current is applied.

Correct ratchet adjustment is indicated when 1/64 to 1/32\* clearance is observed between selector switch contacts and the selector switch rotor as shown in Figure 5. work the plunger by hand and observe clearance If the average at each contact position. clearance is not 1/64 to 1/32\*, correction can be made by loosening ratchet adjustment setscrew and turning actuator rod by hand until correct clearance is observed.

Before ratchet adjustment setscrew is finally tightened, push fixed ratchet 1/32" back into plunger. This increases spring tension against rotating ratchet, thus insuring more positive operation.

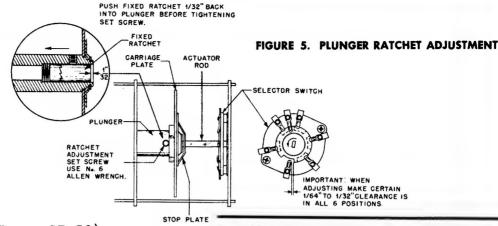






(Motorola Tuner ST-56)

RESET FOR NEXT CYCLE



(Motorola Tuner ST-56)

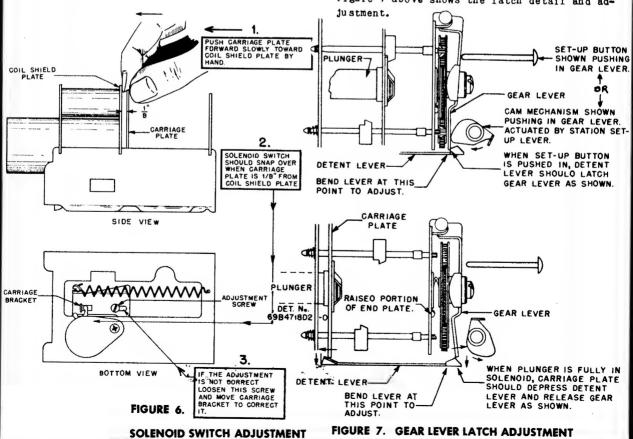
## **SOLENOID SWITCH TRIP ADJUSTMENT**

The solenoid switch tripping mechanism should be adjusted as shown in Figure 6.

If the solenoid switch is tripped too early, the ratchet mechanism may fail to operate; if it trips too late, the plunger may hammer violently or should the solenoid switch fail to trip, the plunger would be held within the solenoid.

## ADJUSTMENT OF GEAR LEVER LATCH

The gear lever latch holds the station set-up gear train in position while setting up stations. Failure of the latch to engage properly when the set-up button is pushed in or the station set-up knob is turned (whichever is applicable) would result in the inability to set up pre-set stations. Failure of the latch to disengage after station is set up would result in faulty automatic tuning because the lead screws might not seat themselves properly against the tuner end plate-figure 7 above shows the latch detail and ad-



## **SERVICE NOTES**

## FAILURE OF SOME LEAD SCREW TO ENGAGE IN SET-UP GEARS

If some of the lead screws fail to engage in the set-up gears during station setting up procedure, check the gear lever to see if it is bent. When the set-up button is pushed in and the gear lever latches on the detent lever, the set-up gear train should be parallel with the tuner end plate and the bottom of the gear train should be resting on the raised portions of the tuner end plate.

#### LUBRICATION

Should lubrication ever be required, it is recommended that a very fine grease, commercially called Lubriplate, or its equivalent, be used.

Remove all old and sticky lubricant with a solvent such as carbon tetrachloride and then, very sparingly, lubricate only the following points:

- 1. Carriage guide rods.
- 2. Actuator rod.
- 3. Manual lead screw.

Do not lubricate or permit lubricant to get on Selector Switch contacts. The friction drag is required for proper operation of tuner.

#### LEAD DRESSING

Make sure that the selector switch and solenoid coil leads are dressed so that carriage plate does not rub against them. Leads rubbing against the carriage plate may cause the tuner to stick, especially at the high frequency end.

# REPLACEMENT OF SOLENOID COIL OR SOLENOID PLUNGER

Should replacement of the solenoid coil or solenoid plunger be required, it will be necessary to replace the entire tuner. A close fit between solenoid plunger and solenoid coil form is required; a proper match can only be secured at the factory. When service of this kind is required, return the tuner to the factory for exchange.

#### TO REPLACE ANT. R.F., OROSC. COILS

IMPORTANT: When ordering replacement coils, order by part number and also specify the color coding (paint dots) on old coil. THE REPLACE-MENT COIL SHOULD CARRY THE SAME

COLOR CODING AS THE ORIGINAL OR THE TUNER WILL NOT TRACK PROPERLY.

- If coil is not readily accessible remove the tuner from the chassis as outlined under "TO REMOVE TUNER FROM CHASSIS."
- Unsolder the two lugs holding the coil to the tuner plate.
- Carefully remove the old coil. Save the thin paper washer that is found at the base of the coil.
- Slip the paper washer over the replacement coil and slip coil into shield can.
- Orient coil so its lugs are in same position as before and resolder to tuner plate.
- 6. Reassemble tuner and install in receiver.
- Realign ANT., R.F. and OSC. stages per instructions found in the receiver service manual.

#### TO REPLACE ANT. R. F. OR OSC COIL TUNING CORES

- 1. The core which tunes the top coil is readily accessible and presents no replacement problem. To reach the two bottom coil tuning cores, remove the tuner from the chassis base as outlined under "TO REMOVE TUNER FROM CHASSIS."
- 2. Remove the carriage return spring.
- 3. Move the carriage plate back as far as it can go. The tuning cores can now be screwed "out" or "in" by grasping the portion that sticks out the back of the coil. When installing a new core, make sure that the insulating washer and adjustment clip are replaced properly. The insulating washer goes on the core side; the core adjustment clip has an ear on it and this ear must fit into a hole in the bakelite insulator on the carriage plate. Refer to Figure 8.
- 4. Replace the carriage return spring.
- 5. Install tuner in receiver.
- Realign ANT., R.F. and OSC. stages following the instructions found in the receiver service manual.

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