

March, 1972

*[Handwritten signature]*

WES INDUSTRIES, INC.  
204 TRIANGLE PLAZA  
DUMFRIES, VIRGINIA 22026

PROPOSAL

MODIFICATION

OF

TAR-224 RADIO SET

SUBMITTED TO

Henry \_\_\_\_\_

## SCOPE OF WORK

WES Industries will provide the necessary personnel, facilities, equipment, services, and materials necessary to modify the Radio Set TAR-224.

WES Industries will guarantee the TAR-224 sets to Specification 68-A-2292-A, exception being taken to paragraph 3.8 through and including 3.8.7.1. Exception is taken to these paragraphs because original production techniques did not conform to these specifications and are not the responsibility of WES Industries, Inc.

WES in the course of modification will restore the wiring and cabling to its present condition, and better the condition where it is of a feasible nature to do so.

## GENERAL

To guarantee the performance of the TAR-224, and to assure that all specifications are met, WES Industries will disassemble the TAR-224 in near entirety.

Disassembly of the TAR-224 will enable WES personnel to thoroughly examine the wiring, components, subassemblies, and major sections of the unit. Defects and irregularities will be noted and corrected.

The entire Radio Set will be cleaned. All foreign matter will be removed.

Reassembly of all units will be governed by strict QC procedures. Electrical adjustments and alignment will be performed as needed.

TAR-224 units will be returned as field serviceable units.

### 1.0 INITIAL PROCEDURE

1.1 WES Industries will thoroughly inspect all incoming TAR-224 units to determine that they are in operating condition. Any defects discovered at this stage, other than routine misalignment, will be discussed with the Customer Technical Representative. Approximate cost of repair will be determined at that time, and the Customer Technical Representative will authorize the repair.

1.2 Following initial inspection, WES Industries will disassemble the TAR-224 units into their four major subassemblies. These subassemblies will be treated separately in the remainder of this proposal.

1.2.1 During the further disassembly of the receiver, the transmitter and the front panel, WES Industries will remove, clean, and coat with Alpha #933 or equivalent all of the printed circuit boards in these subassemblies.

1.2.2 NOTE: With the exceptions of the PC boards listed below, all printed circuit boards will be coated front and back.

Exceptions are noted on three boards:

1. In the receiver unit--Tuner Parent Board Assembly 1A3A5 will be coated on the top side only. The removal of the board assembly could impair the electrical characteristics of the receiver and cause physical damage to the tuning capacitor. This PC board will not be removed.

2. In the transmitter--Interwiring Board No. 1A3A5 will be coated on the top side only. A printed circuit board located in the heat sink assembly will not be coated.

The expense for removal of the above-mentioned PC boards would be great and unjustified.

1.2.3. Coating the PC boards will improve the electrical and mechanical properties of the unit.

1. Mechanically--there are many end-mounted components. Conformal coating these boards will aid in supporting the components.

2. Electrically--RF coils, etc., will not be affected by moisture. If for any reason the air-tight seal is broken, the serviceability of the units will be maintained for a longer duration.

## 2.0 RECEIVER PROCEDURES

### 2.1 Receiver Modifications

2.1.1 To correct the problem of poor bandswitch action and to eliminate the need for rocking the bandswitch knob, WES Industries will install a new bandswitch detent mechanism with a positive detent action. The new detent mechanism will be installed in the approximate location of the Interwiring Board No. 1A3A1 (see Figure 1). This mechanical action will help to eliminate the possibility of misalignment of the band change turrets.

2.1.1.a. WES Industries will supply the new detent block assembly. It will be fabricated of brass and stainless steel. All brass surfaces will be nickel plated. WES Industries will assemble and hand-fit this assembly to provide the necessary smoothness and accuracy.

2.1.1.b. Switch No. 1A3A1S1 will be repositioned in the base of the new mechanical action. A locally-fabricated beryllium-copper spring will actuate the switch. The actuator spring will be hand-fitted to each unit, in order to make the audio cut-out point as exact as possible.

2.1.1.c. WES Industries will replace the present "push-to-turn" knob with a bar-type knob. Since suitable knobs are not available for a 1/8" shaft, WES Industries will obtain a conversion sleeve. Both sleeve and knob will be drilled and tapped for a second setscrew, the unmodified bar-type knob having provision for only one. WES Industries will procure the extra setscrews.

2.1.1.d. Board No. 1A3A1 will be removed completely from the receiver in order to facilitate modifications. The microswitch must be removed from this board prior to its repositioning in the base of the new detent block. Excessively worn switches (the present detent mechanism causes the microswitch to wear at a greatly accelerated rate) will be supplied by the customer. One corner of the board will be cut off for clearance of the new detent block. Board No. 1A3A1 will be re-installed and rewired only after it has been conformal coated on both sides. Any of the connecting wires to the board which have broken will be repaired or replaced at this time.

2.1.1.e. The swaged standoffs for Board No. 1A3A1 must be tight when the board is replaced. Should this not be the case, WES will tighten the crimped bond or apply epoxy adhesive if necessary.

2.1.1.f. If it is found that Glyptol or equivalent has been applied to the bandswitch knob shaft bearing (as has been the case in the past), WES Industries will disassemble and clean the bearing.

2.1.1.g. Since the original board-mounted detent mechanism tends to interfere with the new one, WES Industries will remove the spring-loaded pins under the turrets. This modification will greatly add to the smoothness of the detent action and will further assure that the new detent mechanism will position the bandswitch turrets properly.

2.1.1.h. In order to allow some bandswitch overtravel beyond the Band 1 and Band 4 positions, WES Industries will remove and shorten the

bandswitch stop block, Assembly 340-811. This operation will be performed by hand and precise fit will be checked on each set.

2.1.1.i. The local oscillator turret board No. 1A3A4A1 will be hand-adjusted to eliminate mechanical play.

2.1.1.j. Since the fixed units fastening Board No. 1A3A5 to the receiver main frame prevent free rotation of the turrets, WES Industries will grind these fixed nuts down to the point at which they no longer interfere. This operation will be performed in such a way as to insure that no metal fragments enter other portions of the receiver, and the tuner compartments will be cleaned following this procedure.

2.1.1.k. WES Industries will reposition the foam pads in lid assembly No. 340-848 in order to make sure that the lid holds the turret boards firmly. Since removal of the pads often destroys them, WES Industries will fabricate whatever replacement pads may be needed.

2.1.2. To improve the "feel" of the tuning mechanism (mechanical roughness, excessive backlash, etc.), WES Industries will perform the following operations:

2.1.2.a. WES Industries will procure a nylon dial tape bed plate (see Figure 3) of a new design. This plate will replace the original teflon plate whose shape contributed to excessive friction in the dial tape drive assembly. WES Industries will apply whatever final smoothing processes are necessary in order to minimize dial tape friction from this source.

2.1.2.b. To insure a smooth, positive engagement between the dial tape and its sprocket drive gear, WES Industries will remove the nylon hold-down blocks and install a teflon roller in their place. WES Industries will provide a teflon roller/aluminum shaft combination of a size which will keep enough pressure on the dial tape to prevent buckling as it passes over the sprocket.

2.1.2.c. In sets which use the hold-down blocks as the left-hand cursor stop, WES Industries will install an extra nut and bolt to stop the cursor.

2.1.2.d. WES Industries will replace dial tapes, to be procured by the customer, in the event that the dial tape is warped, broken, or damaged in any other way.

2.1.2.e. WES Industries will replace any dial masks found torn, if the replacement part is provided by the customer.

2.1.2.f. WES Industries will install a new tuning dial lock, to be procured by the customer.

2.1.2.g. WES Industries will install a modified knob clutch supplied by the customer.

2.1.2.h. WES Industries will drill a correctly positioned access hole in compartment No. 340-841-2. The original hole was intended to give access to one of the mounting bolts for the dial mask assembly; however, the hole was placed in such a way as to render it useless for that purpose.

## 2.2.0. Receiver Adjustments.

WES Industries asks that the customer recognize that the modifications outlined above make necessary many adjustments to the receiver. WES Industries also notes that a great many more adjustments are necessitated by the disassembly process itself. Reassembly involves not only the adjustments disturbed in disassembly, but also the correction of many problems present in the set as it was delivered. The following is a list of the more frequent receiver adjustments in all three categories.

### 2.2.1. Electrical Adjustments.

2.2.1.a. WES Industries will align all receivers to conform to the specifications set forth in the WES Industries Quality Control Data Sheet (see enclosure). The test conditions will be those specified by the WES Industries Standard Test Set-Up for the TAR-224 (see enclosure). This Data Sheet will be packed with each unit as it is shipped.

### 2.2.2. Mechanical Adjustments.

2.2.2.a. WES Industries will make whatever adjustments are necessary to insure smooth functioning of the bandswitch mechanism. These adjustments include, where applicable, the following:

1. Adjustment of the dial mask chain tension.
2. Adjustment of the dial mask tension.
3. Repositioning the turret drive gears to minimize play.
4. Tightening the screws which retain the detent cam to its gear.
5. Tightening the screw holding the cam gear bearing post.
6. Adjusting the turret blade contact tension.
7. Adjusting to minimize play and friction in the turret bearings.
8. Adjusting the detent spring tension in the new detent block.

9. Positioning the adjustable bevel drive gear to minimize play.
10. Refastening the turret bearing posts in cases where the post is not mounted vertical to the turret board.

2.2.2.b. WES Industries will make all adjustments necessary to allow smooth tuning action with the least possible backlash.

1. Repositioning the dial tape sprocket crown gear.
2. Positioning the dial tape sprocket shaft with its longitudinal setscrew.
3. Pre-loading the dial drive worm gear correctly.
4. Pre-loading the tuning capacitor anti-backlash gears correctly.
5. Cleaning and oiling the tuning knob shaft bearing.
6. Positioning the sprocket shaft bearing to prevent binding.

#### 2.3.0. Receiver Repairs.

The TAR-224 is constructed in such a way as to make disassembly and reassembly difficult tasks. Portions of the unit are so delicate that they break during normal disassembly. Cleaning and painting the circuit boards result in an entirely different class of failures. Many bolts must be drilled out in disassembly, due to the Glyptol which has been applied to them. Cabled wires are subject to yet other types of damage. WES Industries is prepared to make the following repairs to units which break during processing.

2.3.1. Due to AVCO's use of mechanical strippers on the teflon wiring of the TAR-224, the stripped wire ends are extremely fragile and will withstand very little flexure. When interconnecting wires break, WES Industries will strip them back with a thermal stripper and reconnect them.

2.3.2. WES Industries will replace as many crushed or otherwise damaged wires as it deems practical or necessary to the proper functioning of the TAR-224.

2.3.3. WES Industries will replace all parts broken during processing. Standard parts will be supplied by WES Industries. Parts peculiar to the TAR-224 will be furnished by the customer.

2.3.4. The cleaning and conformal coating processes produce several types of failure in the receiver portion of the TAR-224. WES Industries will deal with these failures as follows:

2.3.4.a. WES Industries will replace all parts damaged by varnish and cleaning solutions. Standard parts will be supplied by WES Industries. Parts peculiar to the TAR-224 will be procured by the customer.

2.3.4.b. Most frequently on circuit boards with ground planes, the cleaning and coating processes cause ground eyelets to open. These eyelets are improperly soldered when the set is delivered, but mechanical contact provides some measure of grounding until the conformal coating is applied. During a period of days or weeks after the coating process, the eyelets often become insulated from the ground plane, causing ground failures which affect whole circuits. To eliminate this problem as a cause of failure, WES Industries will test all eyelets on suspected boards and resolder any eyelets which are open to ground.

2.3.5. Plug-in boards are particularly subject to wire breakage during normal handling. (See paragraph 2.3.1.) Since most of the plug-in boards in the receiver are double boards, broken wires to the multipin connectors may go unnoticed during cleaning and inspection. To prevent major troubleshooting difficulties, WES Industries will check each board independently in a known good receiver chassis. This procedure will uncover any broken wires, open ground eyelets, or other circuit malfunctions.

2.3.6. Since receivers are often delivered with incorrect slugs in the turret coils, WES Industries will interchange or replace any coil slugs found to be of the wrong type. WES Industries will furnish the replacement slugs.

2.3.7. WES Industries will endeavor to repair or replace any damaged turret coils. The pin connections on these coils are often found to be defective.

2.3.8. A few units have the wrong part installed as 1A3A4C7, the 3600 pf capacitor in the Band 3 section of the local oscillator turret. The wrong part is too large and prevents free rotation of the turret. WES Industries will replace this capacitor if necessary. The correct part will be procured by the customer.

2.3.9. WES Industries will inspect the receiver mainframe wiring under circuit board box No. 340-730-1. WES Industries will harness these wires in such a way as to prevent further damage to the wires by the box fastenings.

2.3.10. Eyelets on the tuner parent board No. 1A3A5 present special problems. They cannot be checked directly, since they are located underneath pairs of ceramic disc capacitors which have been glued together

with epoxy. When these eyelets are found to be open, the IF board No. 1A3A7 and its associated box must be removed in order to obtain access to the underside of the parent board. Removal of the capacitors, as an aid to getting at the eyelets, often results in breakage even when the utmost care is exercised. WES Industries will resolder all of these eyelets which require it and will replace any of the ceramic capacitors which become broken in the process.

### 3.0. Transmitter Procedures

#### 3.1. Transmitter Modifications

3.1.1. WES Industries will perform the following modifications to the transmitter section of the TAR-224 in order to convert it to true simplex operation.

3.1.1.a. WES Industries will rewire the transmitter in such a way as to energize the crystal oscillator only during such times as the transmitter is keyed or as the receiver front panel function switch is in the SPOT position.

3.1.2. WES Industries will disassemble and inspect the transmitter output tank circuit No. 1A4A8L1, to determine that the drive shaft of the metal coil drum is drilled on-center and that the drive gear is in good condition.

3.1.2.a. Should the above shaft be drilled improperly, or should the gear be damaged, WES Industries will replace either the shaft or the gear or both. Replacement parts will be supplied by the customer as they are peculiar to the TAR-224. Since tank coil assemblies vary in several respects, WES Industries will hand-fit the stop pins to these replacement shaft parts.

3.1.2.b. WES Industries will make whatever adjustments are necessitated by the disassembly of the tank circuit. These adjustments may include the following:

1. Positioning of the autotune limit microswitches.
2. Adjustment of the coil tape take-up spring tension.
3. Positioning of the coil tape and points.
4. Adjustment of the tension of the contact wiper spring.

3.1.2.c. WES Industries will note any faults discovered during disassembly and inspection and will discuss any such faults with the customer Technical Representative prior to correcting them.

### 3.2.0. Transmitter Adjustments

3.2.1. WES Industries will adjust all transmitters to conform to specifications contained in the WES Industries Quality Control Data Sheet, the test conditions being those outlined in the WES Standard Test Set-Up for the TAR-224 (see enclosures). Exception may be taken in some cases to the transmitter DC power requirements, since the current drawn by the transmitter for a given power output is largely dependent on the individual output transistors in each set.

3.2.2. WES Industries will clean and oil all bearings in the autotune mechanical assembly. WES Industries will make all necessary mechanical adjustments to insure smooth operation of the autotune function.

### 3.3.0. Transmitter Repairs

The transmitter output tank circuit is so fragile that a certain amount of breakage during disassembly and inspection must be expected. The transmitter Low Level Board No. 1A4A7 is subject to the same eyelet problems which affect the receiver. WES Industries will deal with these problems as outlined in the paragraphs below.

3.3.1. WES Industries will replace all parts found defective in inspection. WES Industries will supply all standard replacement parts. Parts peculiar to the TAR-224 will be supplied by the customer.

3.3.2. WES Industries will repair or replace all components damaged by the cleaning and coating processes on the same basis stated in paragraph 2.3.1.

3.3.3. WES Industries will test all eyelets on suspected boards for open circuit to ground, following a period sufficient to allow the conformal coating to stabilize.

3.3.4. WES Industries will repair or replace all broken or damaged wires found during inspection and testing.

3.3.5. Since many of the transmitter tuning knobs have faulty clutch action upon receipt, WES Industries will rework these knobs as necessary to provide reliable clutch action.

### 4.0 Front (Control) Panel Procedures

#### 4.1.0. Front panel modifications

4.1.1. WES Industries will perform the following modifications to the front panel in order to convert the TAR-224 to true simplex operation.

4.1.1.a. WES Industries will rewire portions of the front panel to allow the transmitter crystal oscillator to operate only when the transmitter is keyed or when the receiver function switch is in the SPOT position.

4.1.1.b. WES Industries will rewire the CS-224 jack in such a way that the CS-224 will be operating only while the transmitter is keyed or while the receiver function switch is in the SPOT position. This rewiring will include new standoffs on the back of the CS-224 mounting box. WES Industries will drill the necessary holes and procure the teflon standoffs.

4.1.1.c. WES Industries will replace the original front panel jacks No. 1A1J1 and 1A1J2 with new 6-pin jacks, to be provided by the customer.

4.1.1.d. WES Industries will remove diodes 1A1CR11 and 1A1CR12.

4.1.1.e. WES Industries will install an RF filter on the new power lead to the CS-224 plug.

4.1.2. To correct production faults and to improve reliability, WES Industries will perform the following modifications and checks on the TAR-224 front panel.

4.1.2.a. WES Industries will examine the potting of the receiver dial light bulb and repot it if necessary.

4.1.2.b. WES Industries will place shrinkable sleeving on the hand key terminal lug to prevent keyline shorts.

4.1.2.c. WES Industries will check the TUNE/VOLTS meter mounting for tightness and tighten it if necessary.

4.1.2.d. All jumper wires on the relay bracket will be examined and shortened or sleeved as required.

4.1.2.e. All O-rings around front panel bolts will be examined for cuts or other damage. WES Industries will replace any faulty O-rings.

4.1.2.f. Due to the high failure rate of 1A1L2, WES Industries will test each choke and replace any which are open.

WES DEFECT NOTIFICATION

Unit S/N: \_\_\_\_\_

Date: \_\_\_\_\_

Above unit was defective upon receipt at WES facilities. The defect described below was noted during incoming inspection.

Description of defect: \_\_\_\_\_

\_\_\_\_\_

All reasonable efforts have been made by WES to correct this defect. However, in the absence of parts, WES has been unable to effect a repair.

Unit requires \_\_\_\_\_ @ PN \_\_\_\_\_.

Remarks: \_\_\_\_\_

\_\_\_\_\_

-----

4.1.2.g. WES Industries will clean all areas of the front panel and remove all foreign objects.

4.1.2.h. WES Industries will cut off one corner of the battery charger board No. 1A1A1 so that it will clear the receiver as it is mounted.

4.1.3. To allow front panel monitoring of the moisture content of the TAR-224, WES Industries will install a moisture indicator in a hole drilled into the back of the CS-224 mounting box. WES Industries will furnish the indicator.

4.1.3.a. WES Industries will procure and install a sticker with the statement:

WARNING  
CHANGE DESICCANT  
WHEN INDICATOR IS PINK

This sticker will be attached inside the CS-224 mounting box in an area adjacent to the moisture indicator.

4.1.4. In order to protect external crystal microswitch actuator boot from damage, WES Industries will cement a nylon cap to the top of the bubble. The nylon cap will be supplied by the customer.

4.1.4.a. To improve the reliability of the crystal microswitch actuator, a booster spring, to be supplied by the customer, will be installed under the microswitch mounting bolts. WES Industries will adjust each spring for optimum operation in the individual unit in which it is installed.

#### 4.2.0. Front Panel Repairs

4.2.1. The front panel has two major vulnerable areas--wiring and switches. WES Industries will repair or replace any damaged or broken wires. After modifications have been completed, all cables will be inspected prior to being laced.

4.2.1.a. WES Industries will replace any faulty or broken switches. Replacement parts will be supplied by the customer.

#### 5.0. Final Testing

5.1.0. After the reassembled unit has been thoroughly tested (see WES Industries Quality Control Data Sheet), WES Industries will test

the waterproofing of each unit prior to shipment. Each unit will be pressurized to 12 lbs with dry nitrogen and monitored for leaks. All leaks will be repaired within the limitations of parts availability. Units with leaks which cannot be repaired for any reason will be discussed with the Customer Technical Representative.

5.2.0. Each unit will be subjected to an 8-hour burn-in period, during which it will be cycled to transmit CW for five minutes out of every hour.

5.3.0. Following burn-in, WES Industries will test each unit to make sure that no failure has occurred. The degree of testing will be commensurate with delivery of a consistently acceptable product.

#### 6.0 PACKAGING AND SHIPPING

All TAR units and accessories will be repackaged in their original cartons and delivered F.O.B. Dumfries, Virginia, to the designated customer's facility.

#### 7.0 CS-224 MODIFICATIONS

7.1 WES Industries will modify the CS-224 for simplex operation by altering the power wiring.

7.2 WES Industries will ship the modified CS-224 in a special packing to be supplied by the customer.

7.3. All CS-224 units will be delivered F.O.B. Dumfries, Virginia, to the designated customer's facility.

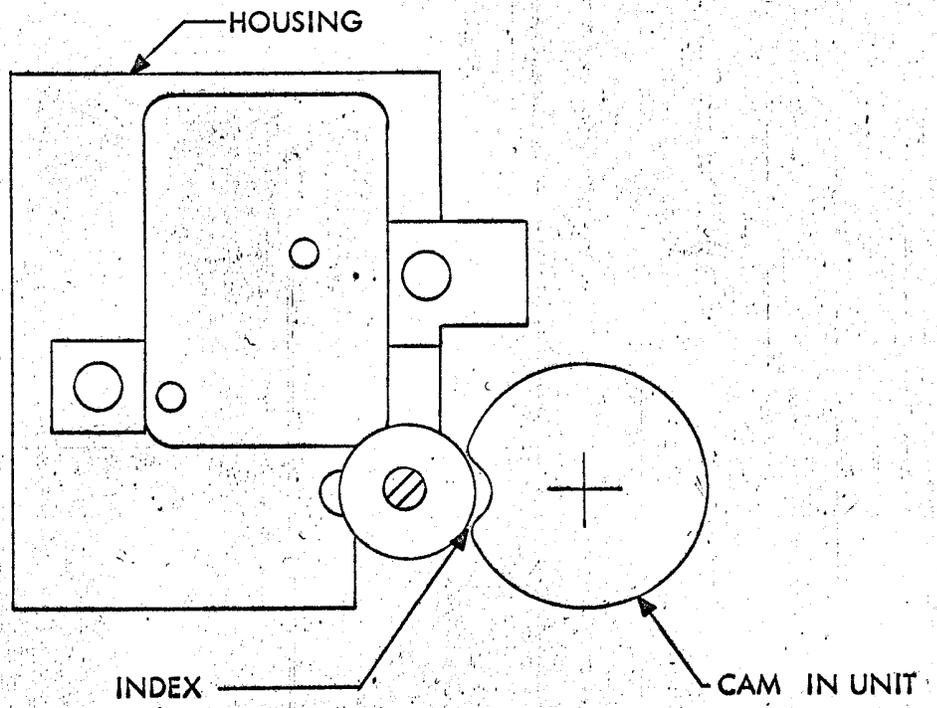


FIGURE 1

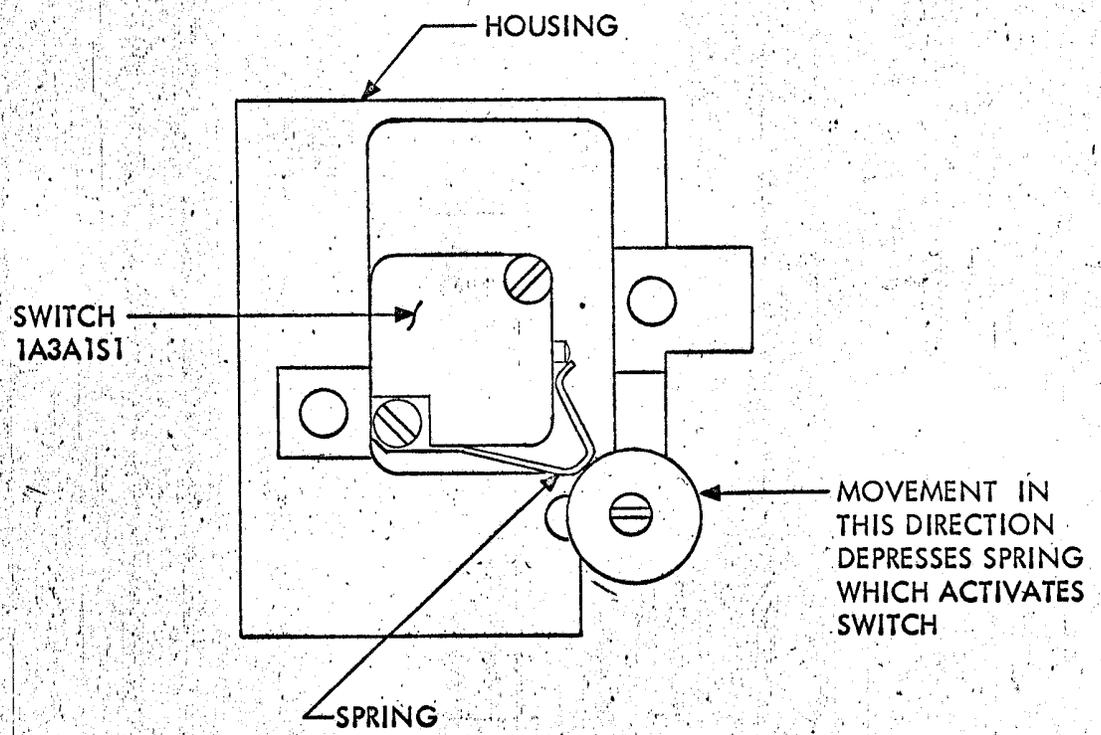


FIGURE 2

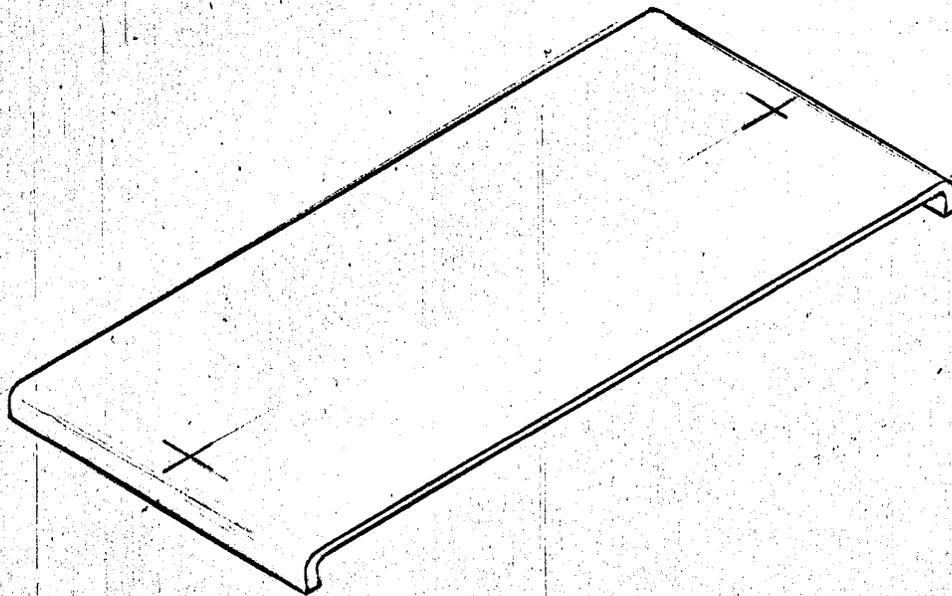


FIGURE 3. NEGATOR DIAL PLATE

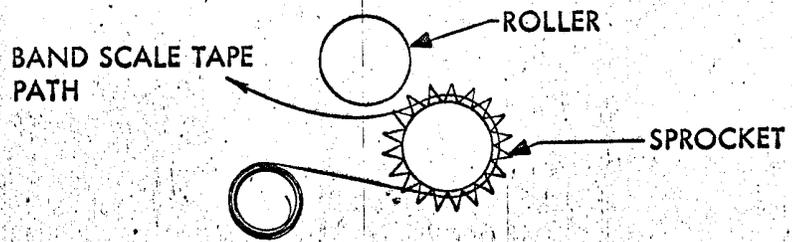
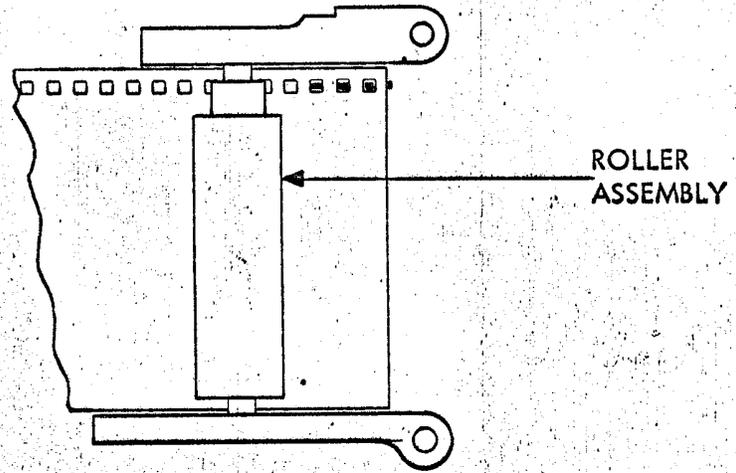


FIGURE 4