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SX-70 Sonar

Camera Repair Book

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EVENTS SUMMARY

The following chart graphically portrays the sequence of events. Basically, the chart shows how the various steps in automatic ranging relate to each other. The following written description explains this interrelationship.

When the S1 button is pressed, the transducer transmits a pulse of ultrasonic waves (chirp). This chirp reflects from the subject back to the transducer, which receives the returning signal. The automatic ranging system measures the time between pulse transmission and reception of the reflected pulse. This time is proportional to the distance of the subject from the camera. The lens is now turned automatically to this distance and locked into position. After the lens has focused, the exposure is made.

Before an exposure, the lens is at a fixed position slightly beyond infinity, known as "park". At the time the ultrasonic pulse is transmitted, an electronic counter is fed by electronic pulses until the reflected signal is received at the transducer. When the reflected signal is received, a motor is turned on which drives the lens and another special gear known as the "encoder". The encoder has a circle of holes near the edge. Positioned over the edge of the encoder is a horseshoe-shaped piece of circuitry known as a "pick-off assembly". As the encoder moves round, driven by the motor, the pick-off assembly shines light through the holes from one side of the encoder, and detects the light by a photocell on the other side of the encoder. An electronic pulse is generated each time light is detected through one of the holes passing by the pick-off assembly.

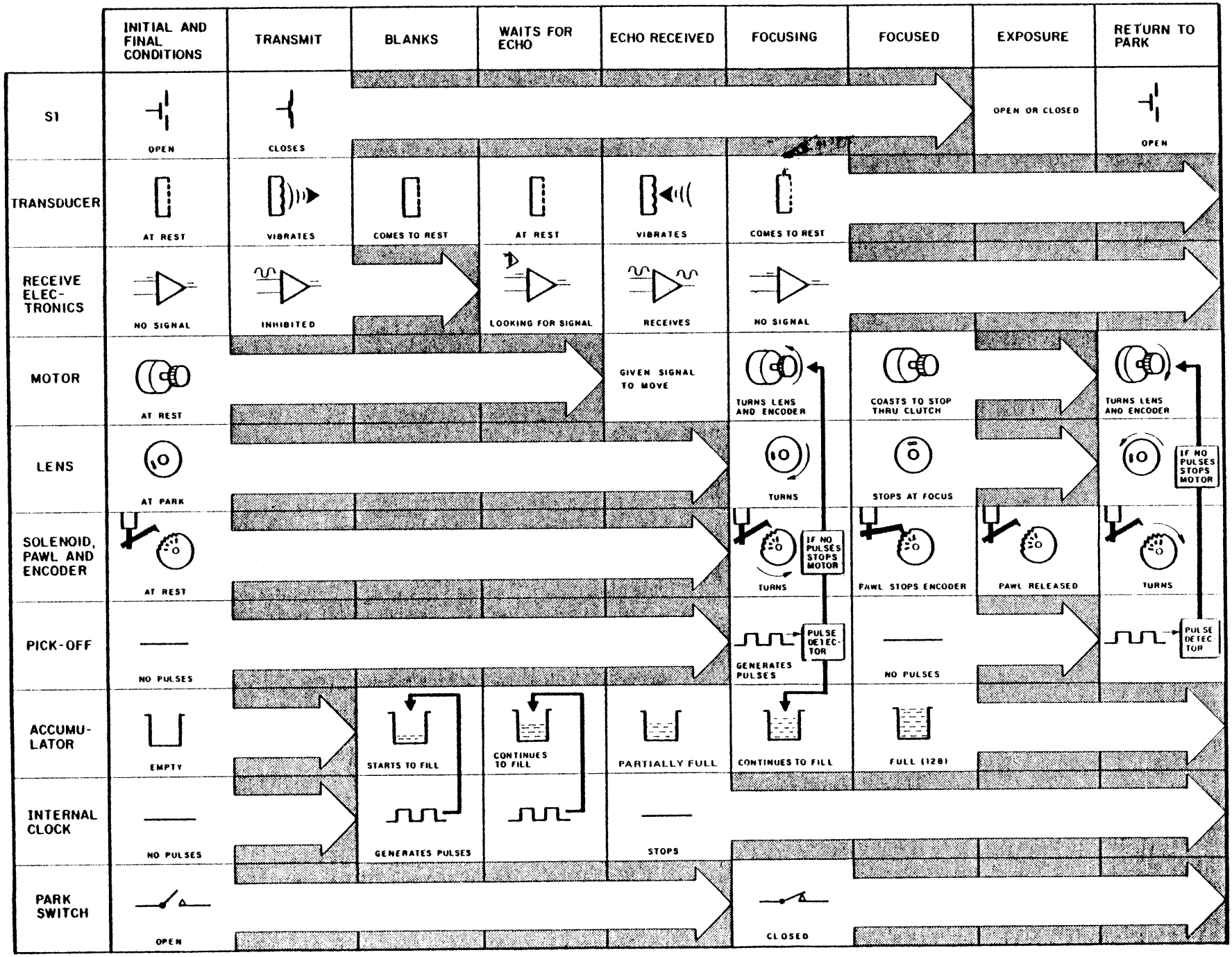
The electronic counter, which had counted the pulses generated between the transmitting of the ultrasonic pulse and the receiving of the reflected ultrasonic pulse, now counts the pulses generated by the pick-off assembly and the encoder. The counter stops counting when it has received a fixed number of pulses (128). When the counter reaches this number, a solenoid is actuated, moving a pawl into a ratchet tooth stopping the movement of the encoder and the lens immediately. The lens is now focused at the correct position. The motor drive signal is removed at this time, and the motor coasts to a stop through clutch action while the pawl holds the lens in position. Once the motor stops, the camera continues to run through its usual exposure cycle. Then, the motor reverses direction and drives the encoder and the lens back to the park position. This finishes the cycle.

If the subject to be photographed is 3 feet away, the number of electronic pulses fed to the counter before the reflected signal is received is 93. To reach a total of 128, the encoder gear must move so that 35 holes pass by the pick-off assembly. This rotation corresponds to a lens rotation bringing it to 3 feet.

If the subject is so far away that the reflected signal takes a long time to return to the transducer, or never returns, the number of electronic pulses fed to the counter is 124. The encoder gear then moves so that 4 holes pass by the pick-off assembly. This moves the lens from "park" to a position known as "synthetic infinity" or the "hyperfocal distance".

A safety feature is designed into the ranging electronics, in case jamming occurs while the encoder gear and lens are being driven (either when focusing or when returning to "park"). The pulses generated by the pick-off assembly and encoder must be fed to the accumulator at a rate higher than some critically designed speed, in order for them to be counted. If the accumulator has not reached its full count of 128 pulses before a time period known as the "jam time", the motor drive signal is removed. When being driven back to "park", the pick-off assembly is generating pulses, which if not generated quickly enough, will again shut down the motor.

RANGING AND EXPOSURE SEQUENCE



II - TESTING THE SX-70 SONAR ONESTEP

SX-70 SONAR COLLIMATION

A. EQUIPMENT REQUIRED

SX 70 Sonar collimation is done on the SX 70 Model 3 Collimator #12040 (Figure 2-1). The major parts of the collimator are:

The Master Camera

This unit is fixed in place on the collimator. When the Sonar camera is being collimated, the operator looks through the eyepiece of the master camera, utilizing its split circle viewing system.

Collimator Horn (Model 3) #12134

The horn houses an illuminated target and provides a mounting platform for the camera being collimated. The target is reflected through the camera being collimated and appears in the split circle image of the master camera.

Actuator Button

The actuator is used to cycle the camera being collimated. This is done to move the taking mirror to its raised setting for collimation and is also used to lower the mirror when the collimation procedure is completed.

Power Supply

The power supply provides 6 vdc power for a lamp which illuminates the target and also powers the camera. The supply is plugged into a 110 vac outlet.

Horn Lock

The lock secures the horn to the collimator main frame. Turning the lock handle frees the horn, allowing it to be removed from the collimator. This versatility allows new horns to be installed as needed. Do not interchange horns between different collimators.

8 Ft. Lens Assembly #12039

An 8 ft. lens assembly comprised of a lens permanently installed in an accessory mount is used to optically check the Sonar camera at the 8 ft. setting.

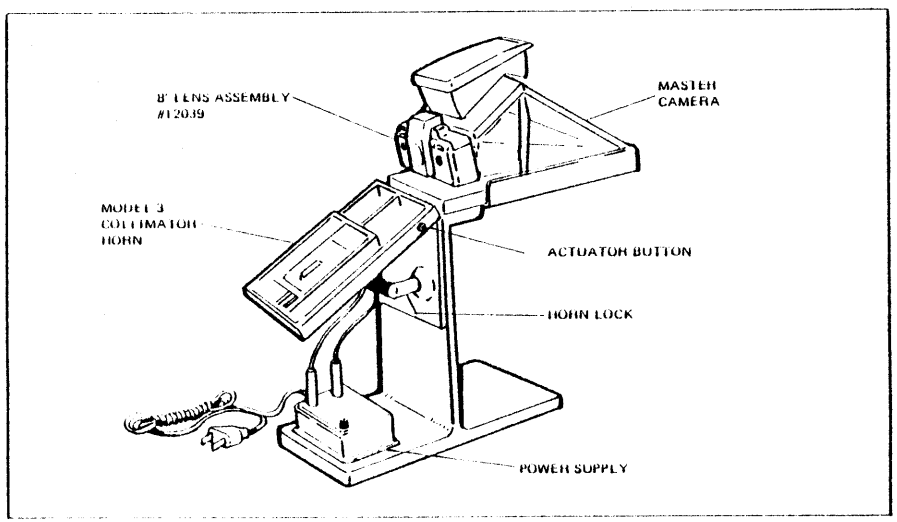


FIGURE 2-1. SX-70 SONAR ONESTEP COLLIMATION SETUP

Other equipment required:

S7 Actuator Clip #11716

The actuator clip is installed on the camera to open the shutter blades for collimation and to move the mirror to the taking position.

Lens Decal Applicator 12226

The applicator is used to install a new lens decal.

B. PROCEDURE

NOTE: Be certain that the 8 ft. lens assembly is installed over the flash socket of the master camera.

1. Remove the front cover assembly of the Sonar camera and install an S7 actuator clip # 11716.
2. Set the Sonar camera A/M switch to MANUAL.
3. Slide the camera onto the collimator horn. Be certain that the camera is fully seated.
4. Bring the taking mirror to the raised position by momentarily depressing the actuator button on the collimator. It is important that the button be depressed only long enough for the taking mirror to be raised. If the button is held too long, the mirror will move to the raised position and then start down again.

CAUTION: If the taking mirror is not in the proper position, the results of the collimation will be inaccurate.

5. Rest your chin on the master camera and look through the eyepiece to observe the illuminated double line target (Figure 2-2). Move your eye relative to the eyepiece until the double line target image is sharpest.

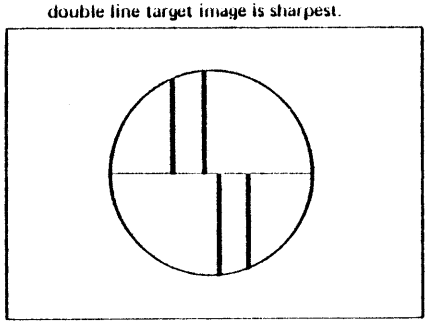


FIGURE 2-2. COLLIMATION TARGET

6. While continuing to look through the master camera eyepiece, rotate the focus wheel of the Sonar camera until the target lines are perfectly aligned (Figure 2-3).

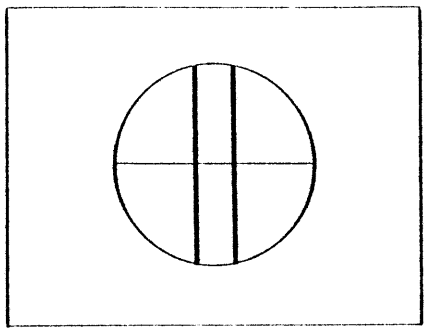


FIGURE 2-3. TARGET LINES PERFECTLY ALIGNED

7. Without disturbing the lens setting, remove the camera from the collimator horn.
8. Observe the position of the lens decal (Figure 2-4). The 8 ft. mark should be lined up with the bezel fiducial line as indicated in the Sonar Cameras Specification Chart which appears at the end of this section.
9. If the 8 ft. lens mark falls within the specification, the camera collimation is OK and you can go directly to the ranging procedure after lowering the mirror with the collimator actuator button. If the 8 ft. lens mark does not fall within the specification, continue below.
10. Without disturbing the lens setting, tape the focus wheel to prevent lens movement.
11. Carefully remove the old lens decal.
12. Install a new lens decal with lens decal applicator #12226 (PA SX-261), insuring that the 8 ft. lens mark is lined up with the bezel fiducial line.
13. Repeat steps 3 through 9 and then go to the ranging procedure after lowering the mirror with the collimator actuator button and removing the tape from the focus wheel.

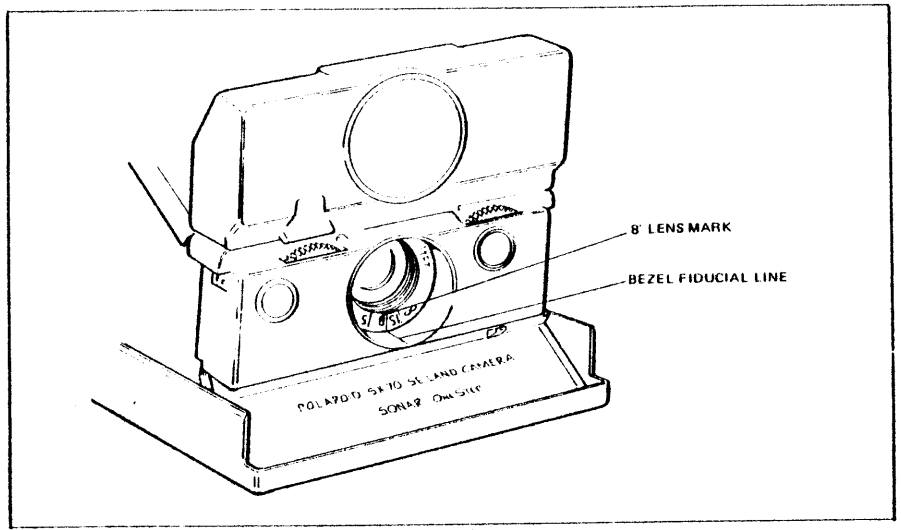


FIGURE 2-4. SX-70 SONAR CAMERA COLLIMATION

SX-70 SONAR RANGING

NOTE: This procedure is to be done only after the camera has been collimated. The front cover assembly should already be removed and the S7 actuator clip should be in place.

A. EQUIPMENT REQUIRED

S7 Actuator Clip #11716

The actuator clip is installed on the camera to close the S7 switch.

SX-70 Test Board #12407

The test board allows the camera to range without going through the exposure cycle.

Dead Flash Bar

May be used in place of test board #12407.

Empty Film Pack with Good Battery

Provides power to range the camera.

B. PROCEDURE

1. Set the Sonar camera A/M switch to AUTOMATIC.
2. Install an empty film pack (with a good battery) and SX-70 Test Board #12407 (or a dead flash bar) into the camera.
3. Position the camera so that the front of the transducer is *exactly* 8 feet from a wall.
4. Press S1 to range the camera.
5. Observe the lens decal (Figure 2-5). The 8 ft. lens mark must be exactly lined up with the bezel fiducial line as indicated in the Sonar Cameras Specification Chart which appears at the end of this section.
6. If the 8 ft. lens mark falls within the specification, the camera ranging is OK and you can go directly to the ambient and flash aperture procedures after removing the film pack and test board (or dead flash bar). If the 8 ft. lens mark does not fall within specification, continue below.
7. Disassemble the Sonar module to the level where the encoder wheel is accessible and go to page 4-11 of the Disassembly/Reassembly section of the SX-70 Sonar Camera Repair Manual.
8. Start with step 10, on page 4-11, and then install the Sonar module according to the instructions on page 4-12. Go to the ambient and flash aperture procedures after removing the film pack and test board (or dead flash bar).

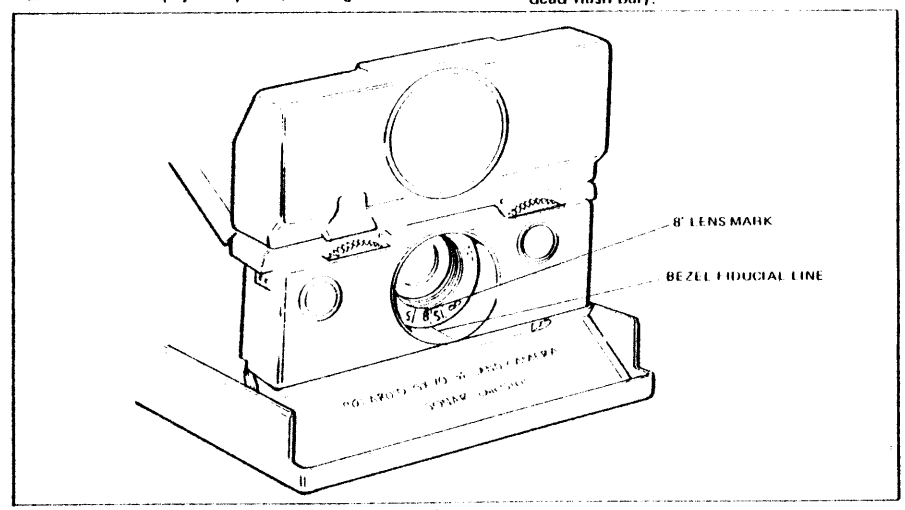


FIGURE 2-5. SX-70 SONAR CAMERA RANGING

SX-70 SONAR CAMERA AMBIENT AND FLASH APERTURE CHECKS ON THE MODEL B TESTER

NOTE: This procedure may be done only after the camera has been collimated and ranging checked. The front cover should be removed and the S7 actuator clip should be in place.

A. EQUIPMENT REQUIRED

Model B Tester #11862

The Model B Tester is used to check ambient and flash aperture readings.

S7 Actuator Clip #11716

The actuator clip is installed on the camera to close the S7 switch.

Remote Shutter Release #112

The shutter release allows S1 to be tripped away from the camera.

S2 Closure #12107 or #12121

The closure shoe closes S2, putting the camera in the flash mode.

Photocell Clip #12017

The photocell clip prevents ambient light from entering the photocell window.

Lens Adjusting Tool #11939

The adjusting tool is used to depress the idler gear to permit focus wheel adjustment.

B. AMBIENT EXPOSURE PROCEDURE

To check the exposure readings obtained in this procedure, refer to the Sonar Cameras Specification Chart which appears at the end of this section.

1. Set the SX-70 Sonar camera A/M switch to manual.
2. Set the L/D control to the midrange position by using a tweezer or jeweler's screwdriver blade to push the trim reset cam. Then focus the camera lens at the park position (all the way in clockwise).
3. Insert a remote shutter release cable into the socket at the right side of the shutter.
4. Slide the camera fully onto the B Tester mounting horn. The camera should cycle (dark slide). Position the horn in the sloped position so that the locating pad on the front of the horn touches the B Tester light source window.
5. Rotate the handle on the Model B Tester light source to 100 cdls/ft.^{2}.
6. Rotate the Range switch on the electronics module to the SX-70 EXP position.
7. Set the Exposure-Aperture Mode switch to the EXPOSURE position.
8. Press the remote shutter release cable button and read the exposure on the meter. Record the reading.
9. Return the Exposure-Aperture Mode switch to the RESET position. If the readings are within specification, proceed to repeat steps 5 through 9 for 800 cdls/ft.^{2} and 6.25 cdls/ft.^{2} measurements. Record the readings.
10. If the exposure readings at 6.25, 100 or 800 cdls/ft.^{2} are out of specification (high or low) on either one, two, or all exposure measurements, proceed to change the original photocell window to a higher stop value window (darker) for a low reading (underexposure) or a lower stop value window (clearer) for a high reading (overexposure).

If the readings cannot be brought within specification by changing the photocell windows:

Sometimes the differences between 6.25 and 100 cdls/ft.^{2} or between 100 and 800 cdls/ft.^{2} are so great that changing the photocell window to bring in one reading throws the other reading out of specification. If you find that this is happening, complete the following procedure.

1. Remove the photocell window from the shutter.
2. Take an exposure reading at each of the light levels (6.25, 100 and 800 cdls/ft.^{2}). With no photocell window in the shutter, all readings should be minus. If any of the readings are plus, replace the entire shutter and repeat steps 1 through 10 above.
3. After ascertaining that the readings without the photocell window are minus, bring the readings as close as possible to the minus side of the specifications by adjusting shutter blade speed. Do this by turning the solenoid needle valve screw. (See RIB SX 70 #230.) Turn the needle valve screw clockwise to lower the exposure reading (more negative) or counterclockwise to increase the exposure reading (more positive). Bring the readings as close as possible to the minus side of the specifications for each light level (6.25, 100 and 800 cdls/ft.^{2}).
4. When the readings are as close as possible to the minus side of the specifications range, install a photocell window that will bring all the readings within specification.
5. If you cannot bring the readings within specification using the needle valve adjustment in conjunction with a new photocell window, it will be necessary to replace the solenoid, ECM, or entire shutter. Analyze the camera and make the necessary replacement. After replacing the necessary part, repeat steps 1 through 10 above.

C. FLASH APERTURE PROCEDURE

NOTE: Perform this check only after completing the ambient exposure procedure. The camera A/M switch should already be in MANUAL, the L/D control should be at midrange, the remote shutter release cable should be installed, and the camera should be fully inserted on the tester horn against the light source window.

1. Rotate the focus wheel 8 ft. mark to line up exactly with the lens bezel fiducial mark.
2. Insert S2 closure #12107 or# 12121 into the camera flash socket and position the yellow photocell clip #12017 over the shutter photocell.
3. Rotate the handle on the Model B Tester light source to 800 cdls/ft.^{2}.
4. Rotate the Range switch on the B Tester to the 8 ft. position.
5. Set the Exposure-Aperture Mode switch to the APERTURE position.
6. Press the remote shutter release cable #112 button and read the aperture on the meter. Record the reading.
7. Return the Exposure-Aperture Mode switch to the RESET position. If the reading is within specification, the 8 ft. flash aperture measurement is OK and you can go directly to step 11. If the reading is out of specification (high or low), remove the camera from the B Tester horn and continue below.
8. If the 8 ft. flash reading is out of specification on the high side (overexposure) depress the idler gear and rotate the focus wheel. (See RIB SX-70 #125.) Turn the focus wheel counterclockwise in one tooth increments to bring the reading into specification. (Each tooth represents 0.23 stops on the B Tester aperture reading.)

NOTE: Do not disturb the 8 ft. lens setting during focus wheel adjustments.

9. If the 8 ft. flash aperture reading is out of specification on the low side (underexposure), the focus wheel should be turned clockwise in one tooth increments.
10. Install the camera on B Tester horn and retest. The 8 ft. flash aperture measurement is completed. Follow below for 10.4" flash aperture measurement.
11. Rotate the focus wheel to the 10.4" position (all the way out).
12. Rotate the Range switch in the B Tester to the 10.4" position.
13. Set the Exposure-Aperture Mode switch to the APERTURE position.
14. Press the remote shutter release cable #112 button and read the aperture on the meter. Record the reading.
15. Return the Exposure-Aperture Mode switch to the RESET position. If the reading is within specification, the 10.4" flash aperture measurement is completed. If the reading is out of specification, remove the camera from the B Tester horn and proceed below.
16. Remove the upper front housing and shutter front housing from the camera.
17. Install a test shutter housing on the camera.

NOTE: A test shutter housing can be made using an old defective shutter front housing. Cut out the area around the focus wheel area as shown in Figure 2-6. This cut out area allows you to turn the slotted eccentric cam in the cam follower assembly with a jeweler's screwdriver.

18. Install the photocell clip #12017 to block ambient light from the photocell.

19. Place the camera on the B Tester horn and position the horn so the locator pad touches the light source window.

20. Turn the eccentric cam clockwise to bring in the 10.4" specification. This changes the relationship of the cam follower interceptor and the walking beam, enabling you to bring in over or under readings. Using trial and error, find the proper relationship of the interceptor and walking beam using ONLY CLOCK WISE ROTATION. Alternately adjust and retest until the 10.4" reading is in specification. When the reading is in specification, this test is complete and you may remove the camera from the tester and replace the original SFH and upper housing.

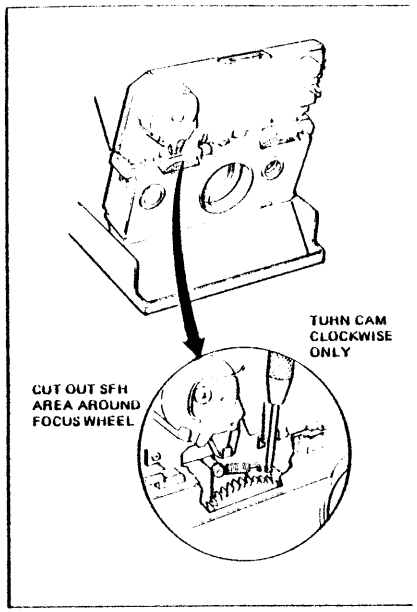


FIGURE 2-6. USING MODIFIED SFH FOR CAM FOLLOWER INTERCEPTO ADJUSTMENT

2-7

SX-70 SONAR CAMERA GAIN MEASUREMENT

NOTE: This test is done to determine the ability of the Sonar camera to discern certain sized objects at a preset distance. See T.E.B. #36 dated May 1979.

A. EQUIPMENT REQUIRED

1. Tripod
2. 0.67" Sphere #12411
3. Baffle #12418
4. 2.00" Sphere #12410
5. Tape Measure
6. Aiming & Framing Target #12417
7. Gain Test Sphere Holder #12414

B. SET UP

1. Choose a flat wall surface, preferably one constructed with wooden studs.
2. Hang Aiming & Framing Target #12417 as shown in Figure 2-7.
3. Install Gain Test Sphere Holder #12414 on the target, over the printed square. Secure the holder to the wall stud using wood screws. If the wall does not have wooden studs, use some other method to secure the holder firmly. (Moly bolts or toggle bolts may be used with hollow walls.)

C. TEST PROCEDURE

1. Install an empty film pack with a known fresh battery in the camera and a dead flashbar into the flash socket. Secure the camera on a tripod.
2. Adjust the tripod to get the transducer at the same height as the sphere holder post.
3. Install Baffle # 12418 and 0.67" Sphere # 12411 on the sphere holder (Figure 2-8).

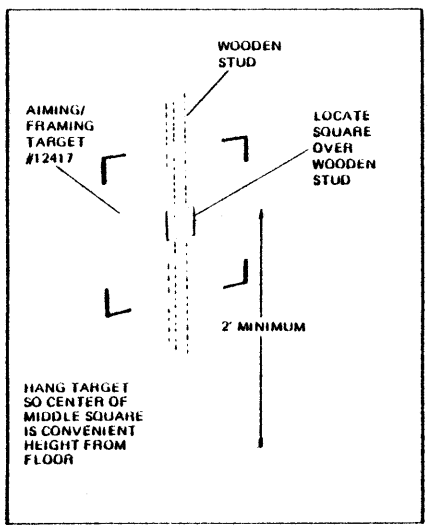


FIGURE 2-7. SETTING UP AIMING & FRAMING TARGET

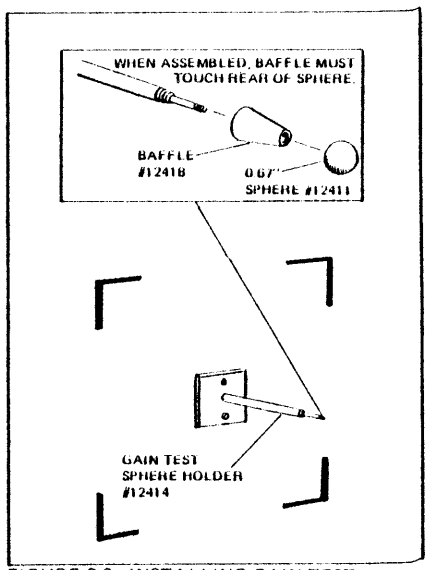


FIGURE 2-8. INSTALLING GAIN TEST SPHERE HOLDER

2-8

4. Set the distance between the sphere and the transducer to 4'8" using a tape measure (Figure 2-9).

5. Look through the viewfinder while adjusting the tripod to center the target (Figure 2-10). With the SX-70 Sonar, press ST before looking through the viewfinder. This will sharpen the image and set the lens at the proper place.

CAUTION: Use extreme care to prevent disturbing the camera on the tripod in the following steps.

6. Cycle the camera six times, ignoring the first two cycles. Observe the movement of the lens decal on the last four cycles:

   The lens decal should move beyond the 5 ft. setting. This indicates that the camera *is not* focusing on the 0.67" sphere. If the lens decal indicates a setting of less than 5 ft., the camera *is* focusing on the 0.67" sphere and the camera gain is not set properly. Replace the transducer. (See RIB SX-70 Sonar #8 dated December 1979.)

7. Remove the 0.67" sphere and the baffle from the sphere holder. Install the 2.0" sphere on the holder.

8. Set the distance between the sphere and the camera to 4'3" using the distance string.

9. Cycle the camera six times. Observe the movement of the lens decal on each of the cycles:

   The lens decal should move to a setting just less than 5 ft., indicating that the camera is focusing on the 2.0" sphere. If the lens decal indicates a setting more than 5 ft., replace the transducer. (See RIB SX-70 Sonar #8 dated December 1979.)

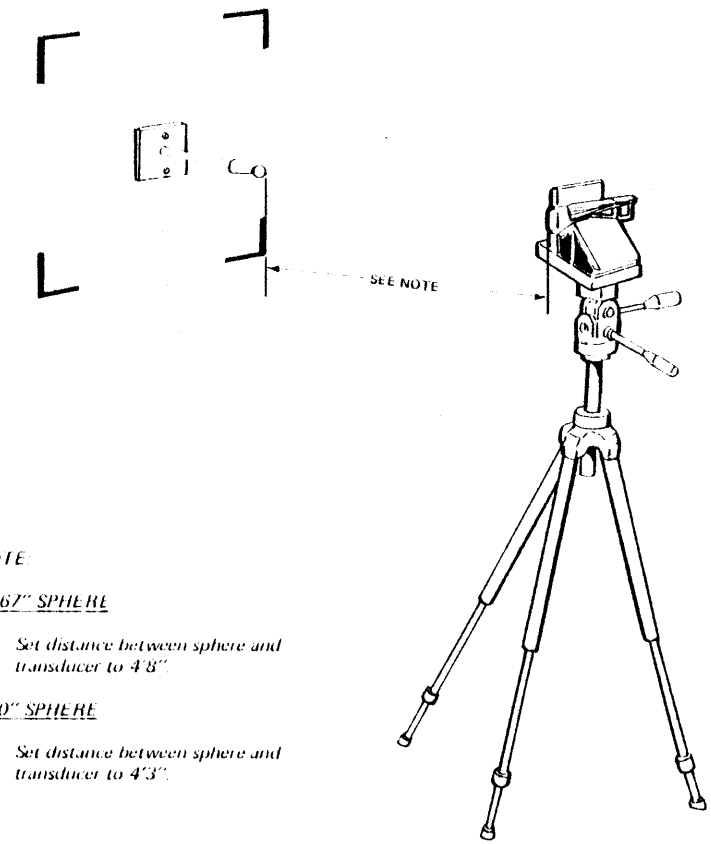


FIGURE 2-9. SETTING THE DISTANCE BETWEEN CAMERA AND TARGET

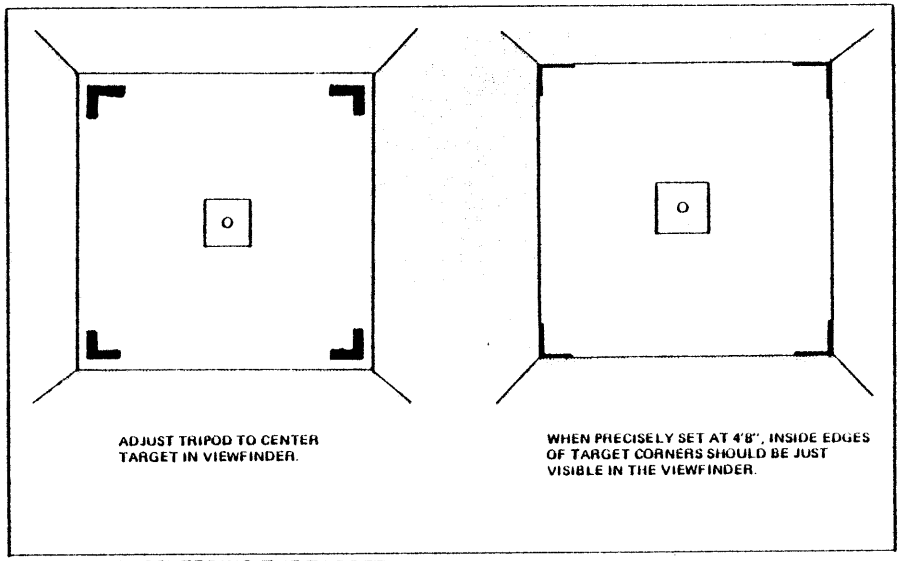
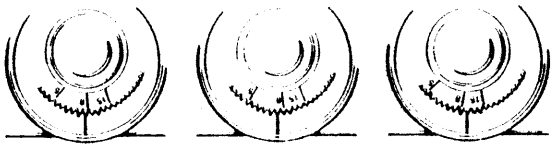
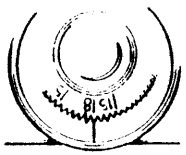


FIGURE 2-10. CENTERING THE TARGET

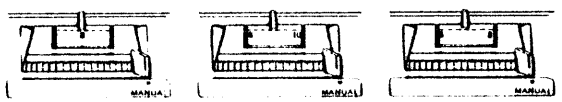
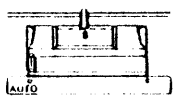
SONAR CAMERAS SPECIFICATION CHART

COLLIMATION AND RANGING SPECIFICATIONS

SX-70 SONAR ONESTEP

Test	Specification	Examples
8' Collimation	8' mark on lens decal is lined up with bezel fiducial mark within ± one tooth.	
Ranging	8' mark on lens decal is exactly lined up with bezel fiducial mark within ± one tooth.	

PRONTO SONAR ONESTEP

Test	Specification	Examples
8' Collimation (Lens at MANUAL)	8' mark on lens bezel must be seen in its entirety in the window.	
Ranging (Lens at AUTOMATIC)	8' mark on lens bezel must be exactly lined up with white line on top of apron.	

SONAR CAMERAS SPECIFICATION CHART

MODEL B TESTER SPECIFICATIONS

SX-70 SONAR ONESTEP (Shutter Configurations AP, AQ)

Test	Specification	Difference in Readings (Not More than 3)
Ambient Exposure		
6.25 cdls/ft.^{2}	−0.15 to +0.45	0.10 stops
100 cdls/ft.^{2}	−0.25 to +0.25	0.15 stops
800 cdls/ft.^{2}	−0.05 to +0.65	0.25 stops
Flash Aperture		
8 feet	−0.30 to +0.30	
10.4 inches	−0.25 to +0.35	

PRONTO SONAR ONESTEP

Test	Specification
Ambient Exposure	
6.25 cdls/ft.^{2}	0.00 to +0.60
100 cdls/ft.^{2}	−0.20 to +0.20
800 cdls/ft.^{2}	+0.05 to +0.55
Flash Aperture	
3 feet	−0.40 to +0.10

GAIN MEASUREMENT SPECIFICATIONS

SX-70 SONAR ONESTEP

Test	Specification
Ranging on 0.67" sphere at distance of 4'8".	Camera *should not* focus on 0.67" sphere.
Ranging on 2.00" sphere at distance of 4'3".	Camera *should* focus on 2.00" sphere.

PRONTO SONAR ONESTEP

Test	Specification
Ranging on 0.67" sphere at distance of 4'8".	Camera *should not* focus on 0.67" sphere.
Ranging on 2.00" sphere at distance of 4'3".	Camera *should* focus on 2.00" sphere.

III - TROUBLESHOOTING THE SX-70 SONAR ONESTEP

INTRODUCTION

This section consists of two parts: a functional checkout procedure and a series of troubleshooting charts designed to solve sonar module problems.

The functional checkout allows you to isolate defects to a certain level. Once the defect is isolated, the checkout will then direct you to a particular troubleshooting chart. Following the proper leg of the chart will guide you through further checks which will pinpoint the problem. The corrective action is noted in the chart.

Disassembly of the camera for troubleshooting should be limited. Figure 3-1 shows the camera disassembled and set up for testing. Figure 3-2 is a wiring diagram showing test points.

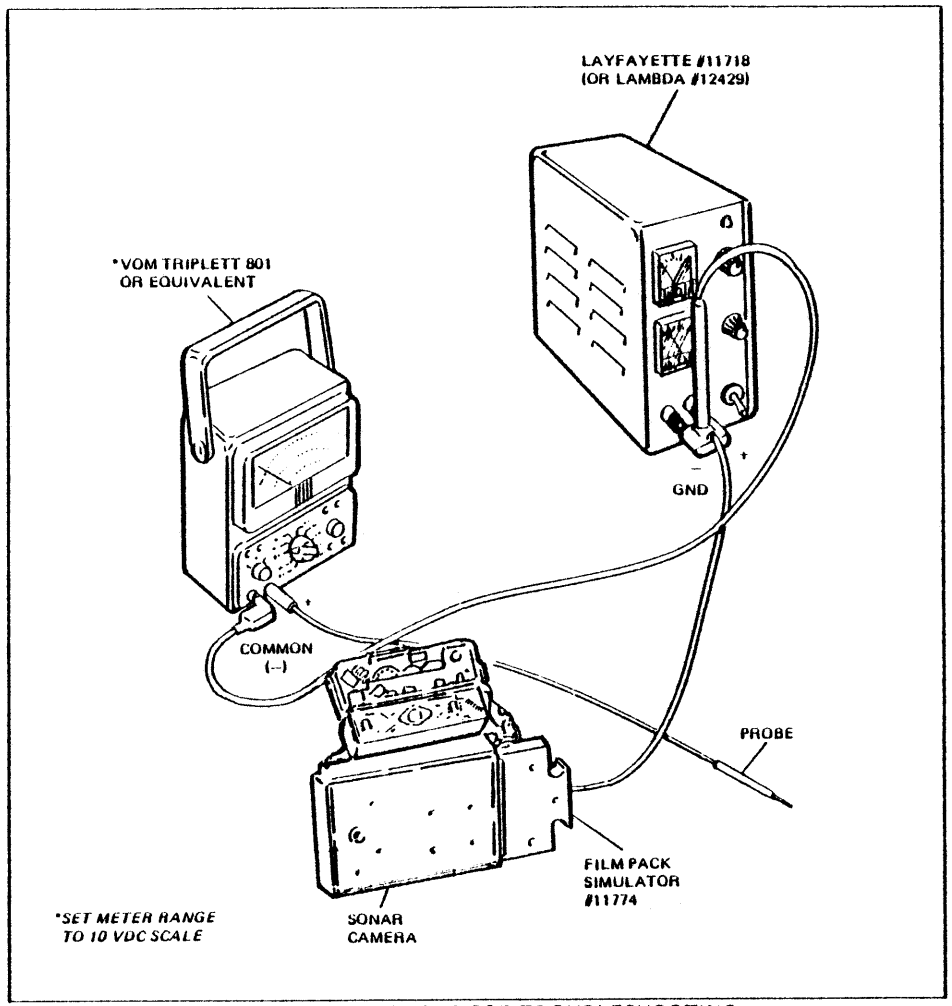


FIGURE 3-1 SX-70 SONAR ONESTEP SET-UP FOR TROUBLESHOOTING

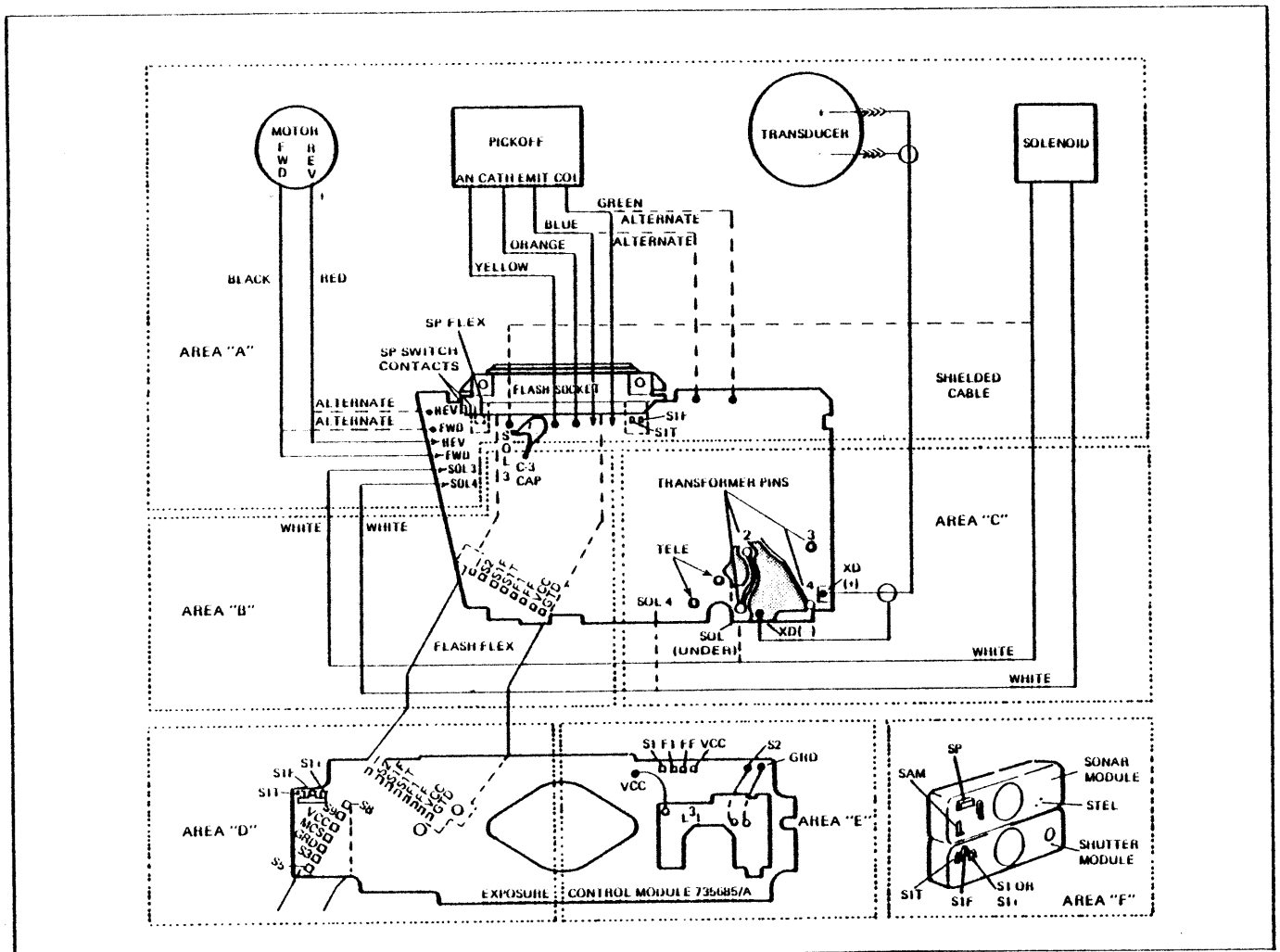


FIGURE 3 - 2 WIRING DIAGRAM

FUNCTIONAL CHECKOUT

The following checkout should tell you if the sonar portion of the camera is operating properly. If it is not, the checkout directs you to the proper troubleshooting chart where you can determine the corrective action to take.

1. a. Set the A/M switch to automatic and observe that the lens is at park.
   b. Close S-7 with S-7 actuator #11716 and install a film pack simulator #11774 connected to power supply #11718 or #12429. Check for dark slide cycle and observe current meter.
      - **If no dark slide cycle and no amp draw, see Alpha Troubleshooting Charts.**
      - **If HiAmp draw or amp draw after dark slide, see SX-70 Sonar Troubleshooting Chart #1.**
2. a. Insert Sonar Test Board #12407 and aim at a wall 8' away.
   b. Press the S-1 button and hold the button in. After ranging, the lens should be at 8' and all four LEDs on the test board should be lit.
   c. Release S-1 and observe that the lens returns to park.
   d. Repeat step 2a, b and c four more times.
   e. Remove the Sonar Test Board. Press S-1 and observe that the lens ranges, the camera cycles and the lens returns to park after the button is released.
      - **If lens does not range, see chart #2.**
      - **If lens ranges to hyperfocal,* see chart #3.**
      - **If lens ranges to between 3 and 5', see chart #4.**
      - **If lens ranges to less than 8' and coasts to a stop, see chart #5.**
      - **If there is a chattering noise before or after ranging, see chart #6.**
      - **If the ranging is excessively noisy, see chart #7.**
      - **If the lens ranges to 10.4", see chart #8.**
      - **If the lens ranges to 8' but the LEDs on the Sonar Test Board do not light, see chart #9.**
3. Press the telephoto switch while ranging at a wall 8' away. Observe that the lens moves to 3 1/2'.
   - **If lens ranges to 8', see chart #10.**
4. a. Remove the Sonar Test Board.
   b. Cover the photocell.
   c. Aim at a close up (10.4") subject and lightly press the S-1 button. Observe that the lens moves to 10.4" and that no exposure occurs.
   d. Now, press S-1 all the way and observe that the shutter blades open.
   e. Release S-1 and observe that the shutter blades close before the lens returns to park.
      - **If the lens ranges to any distance other than 10.4" refer to the appropriate chart noted in step 2.**
      - **If exposure occurs with S-1 lightly pressed, see chart #11.**
      - **If the lens ranges but there is no exposure, see chart #12.**
      - **If the lens ranges but returns to park during the exposure, see chart #13.**
5. a. Insert Remote Shutter Cable #112 on the camera.
   b. Face the camera toward you so you can observe lens movement and shutter operation.
   c. Press the S-1 remote button and observe that the lens ranges, the camera cycles, and the lens returns to park when the S-1 remote button is released.
      - **If the lens does not range with the S-1 remote, see chart #14.**

*Hyperfocal on the lens bezel is just slightly beyond the mid point of the infinity symbol when the lens is ranging toward 10.4".

6. a. Remove Remote Shutter Cable #112 and set the A/M switch to manual.
   b. Press the S-1 button and observe that the camera cycles but the lens does not range.
      - **If you cannot switch to manual or if the lens ranges in manual, see chart #15.**
7. a. Aim the camera at a brightly lit area or shine a flashlight into the L^{3}I photocell.
   b. Press the S-1 button lightly while looking through the viewfinder. Observe that the red LED is not lit.
   c. Now, aim the camera at a dark area.
   d. Press the S-1 button while looking through the viewfinder. Observe that the red LED is lit and visible in the viewfinder.
   e. Insert Flash Simulator #11821 into the camera flash socket and turn switch #5 OFF.
   f. Aim the camera at a dark area.
   g. Press S-1 lightly while looking through the viewfinder. Observe that the red LED is not lit.
      - **If any of the observations above are incorrect, see chart #16.**
8. a. With the A/M switch in automatic and the flash simulator still in the flash socket (all switches ON), press the S-1 button all the way. Observe that the lens ranges, the camera cycles and the #1 LED on the flash simulator flashes.
   b. Repeat this step four more times, consecutively turning OFF switches #1 through #4. Observe that LEDs #2, #3, #4, and #5 flash consecutively with each cycle.
   c. Turn OFF switch #5 and press the S-1 button all the way. Observe that the lens ranges but that the camera does not cycle (6th flash inhibit).
      - **If any of the observations above are incorrect, switch the A/M switch to manual and repeat the entire sequence.**
      - **If flash problems are observed with the A/M switch in manual, refer to the SX-70 Alpha Troubleshooting Charts.**
      - **If flash problems are observed only with the A/M switch in automatic, see chart #17.**

CAMERA SET UP FOR TESTING

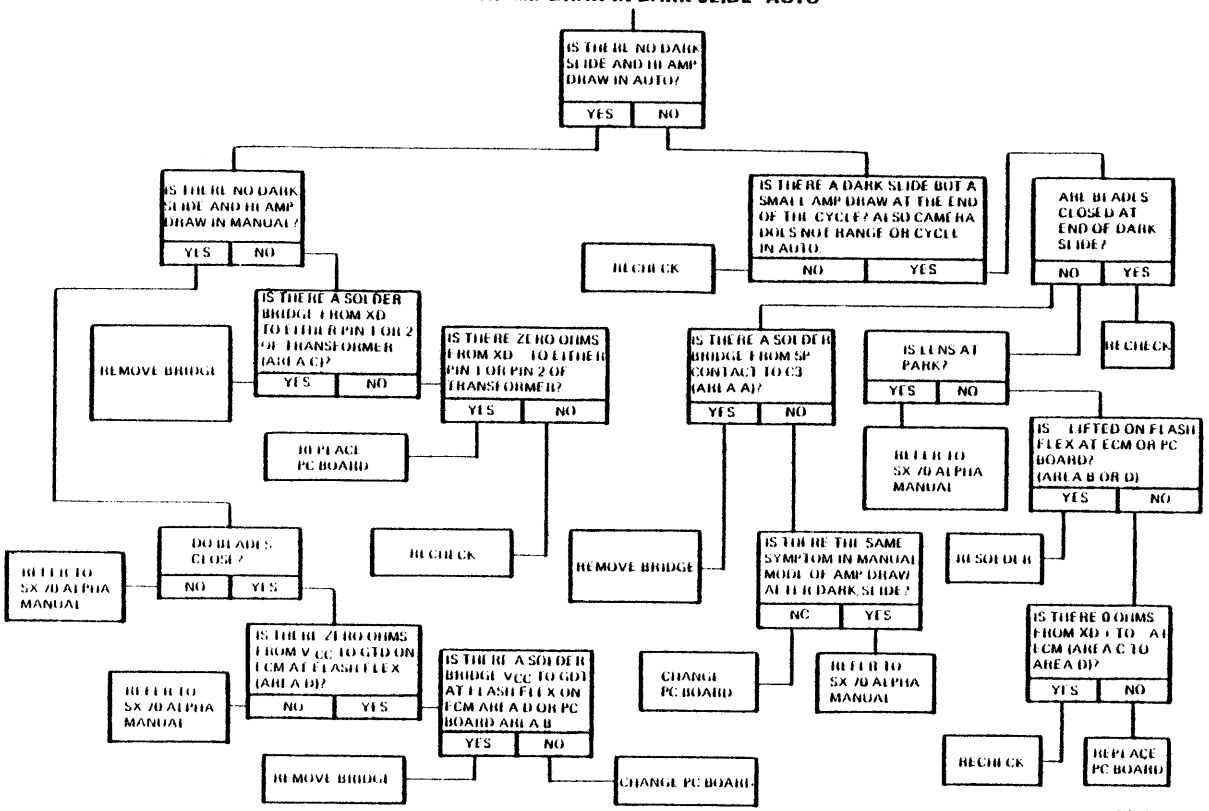
Figure 3-1 shows the SX-70 Sonar OneStep set up for complete testing. In most cases it will not be necessary to disassemble the camera to the configuration shown. Remove only those parts which make troubleshooting easiest. When necessary to disassemble the camera to the level shown in Figure 3-1, proceed as follows:

1. Remove the front cover.
2. Remove the four shutter hinge bracket-to-shutter screws.
3. Carefully place the shutter/module on top of the camera as shown.
4. Close switch S-7 using S-7 Actuator Clip #11716.
5. Set the power supply (either Lafayette #11718 or Lambda #12429) to 5.8 volts.
6. Connect the Film Pack Simulator #11774 to the power supply and insert it into the camera.
7. Connect the VOM (Triplett 801 or equivalent) to the power supply as shown. (Use the VOM to do voltage checks as required in the troubleshooting charts.

Disassemble the camera further only as required by particular steps in the troubleshooting charts.

SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #1

HI AMP DRAW IN DARK SLIDE—AUTO



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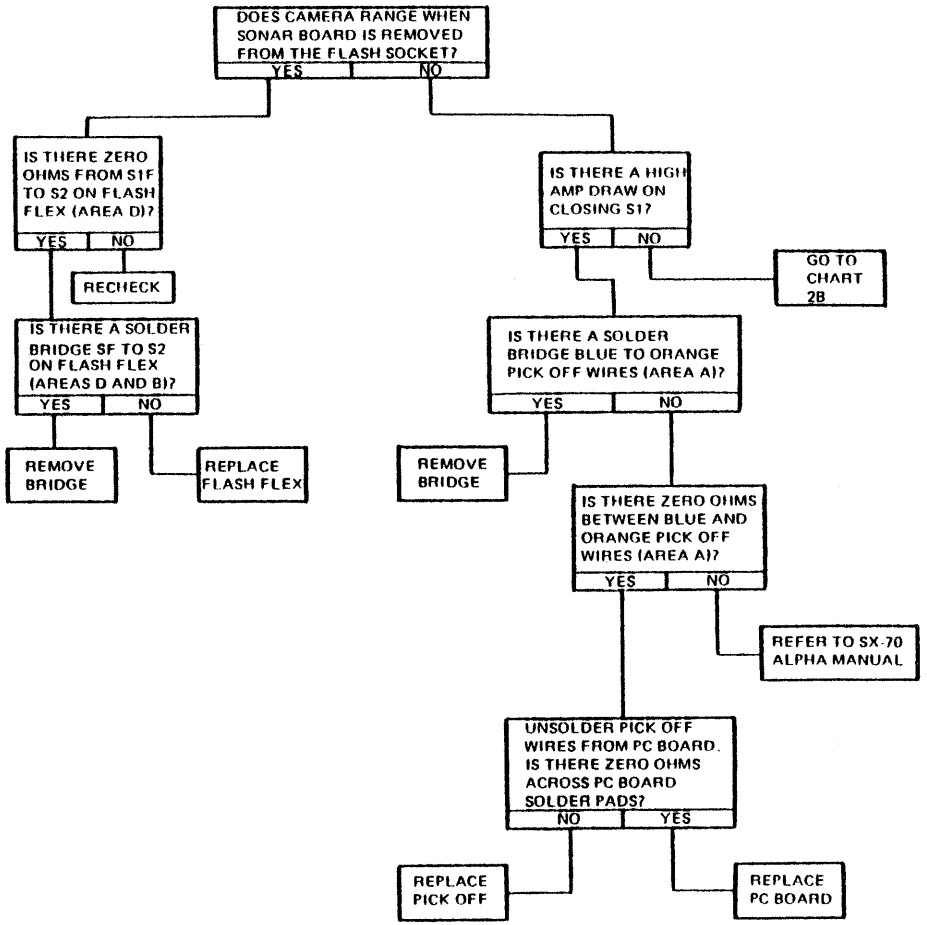
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #2A

NO RANGING



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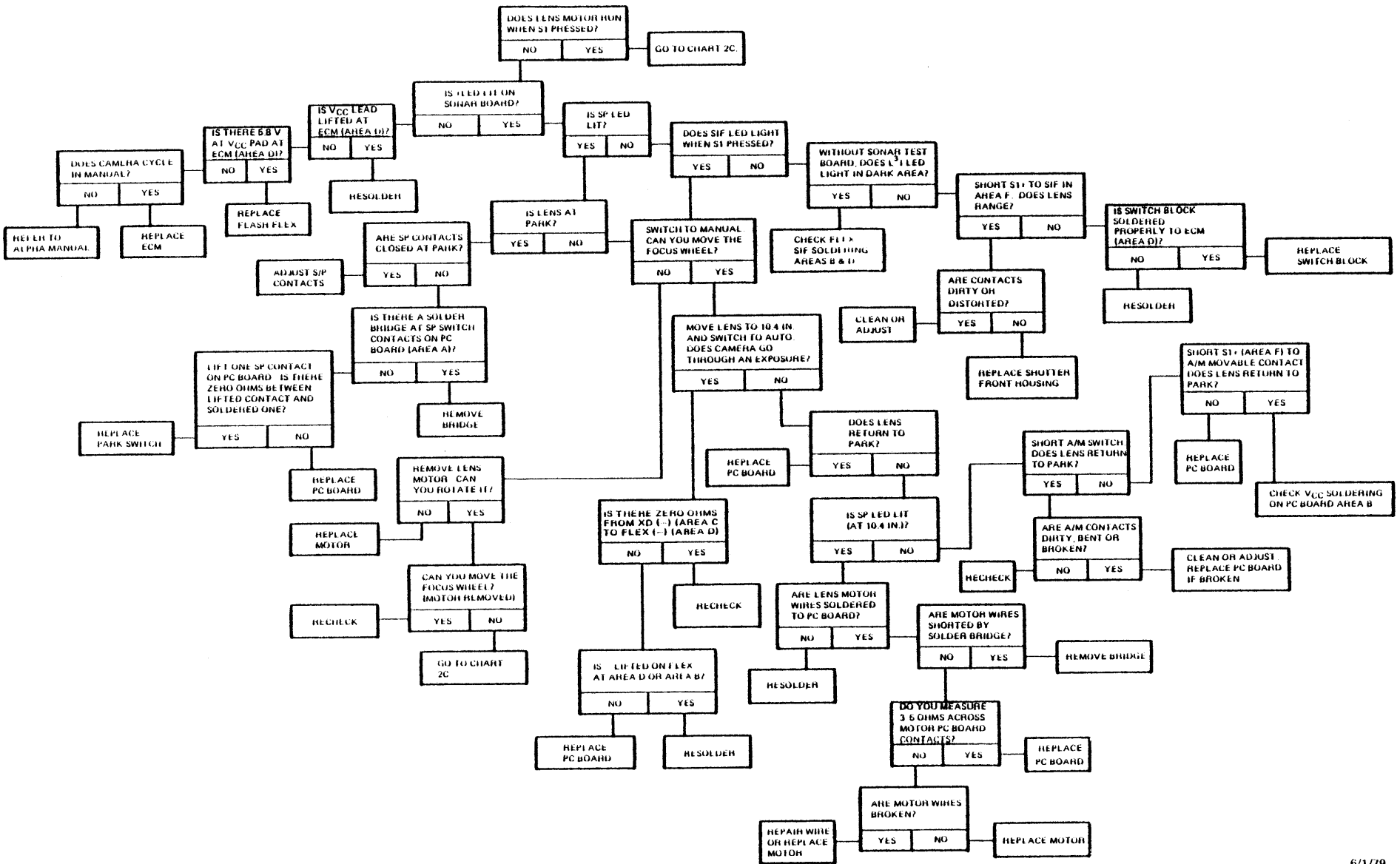
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #2B

NO RANGING (CONTINUED)



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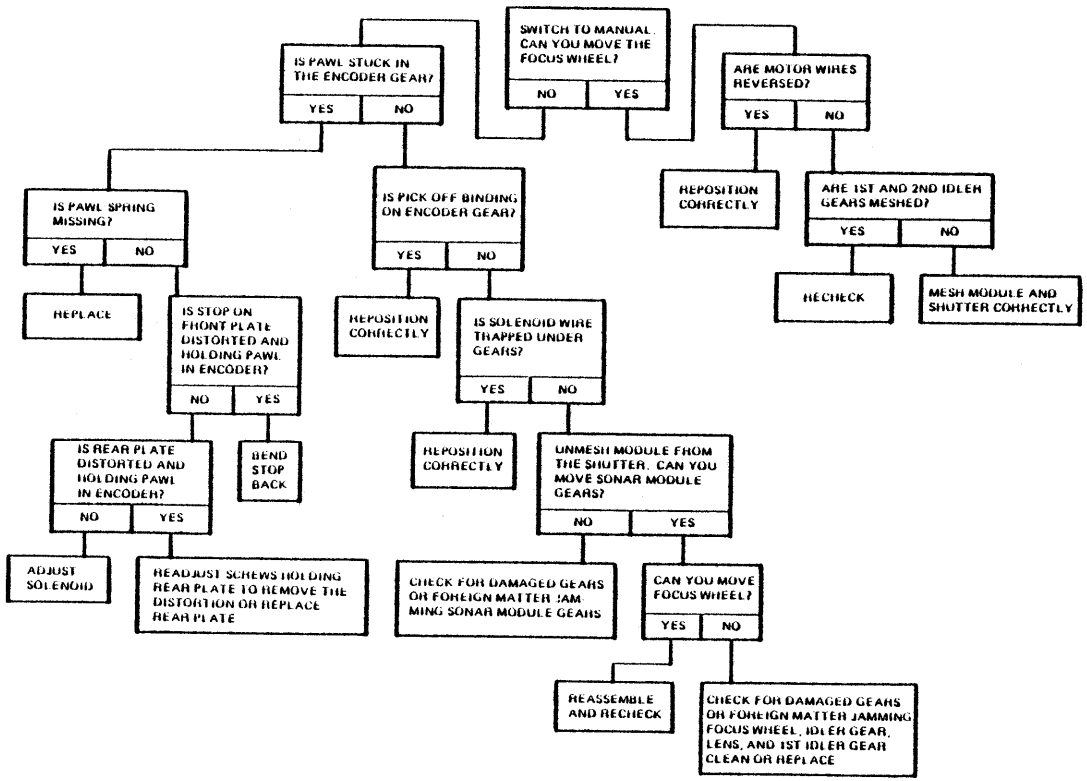
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #2C

NO RANGING (CONTINUED)



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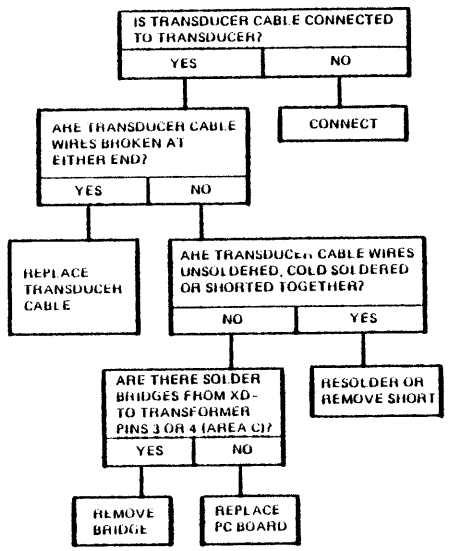
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #3

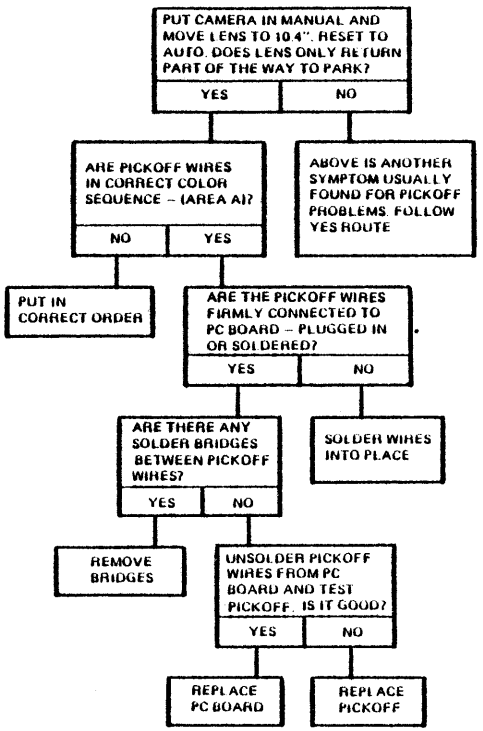
RANGES TO HYPERFOCAL *



*HYPERFOCAL ON THE LENS BEZEL IS JUST SLIGHTLY BEYOND THE MID-POINT OF THE INFINITY SYMBOL WHEN THE LENS IS RANGING TOWARD 10.4".

SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #4

RANGES TO BETWEEN 3 AND 5 FEET



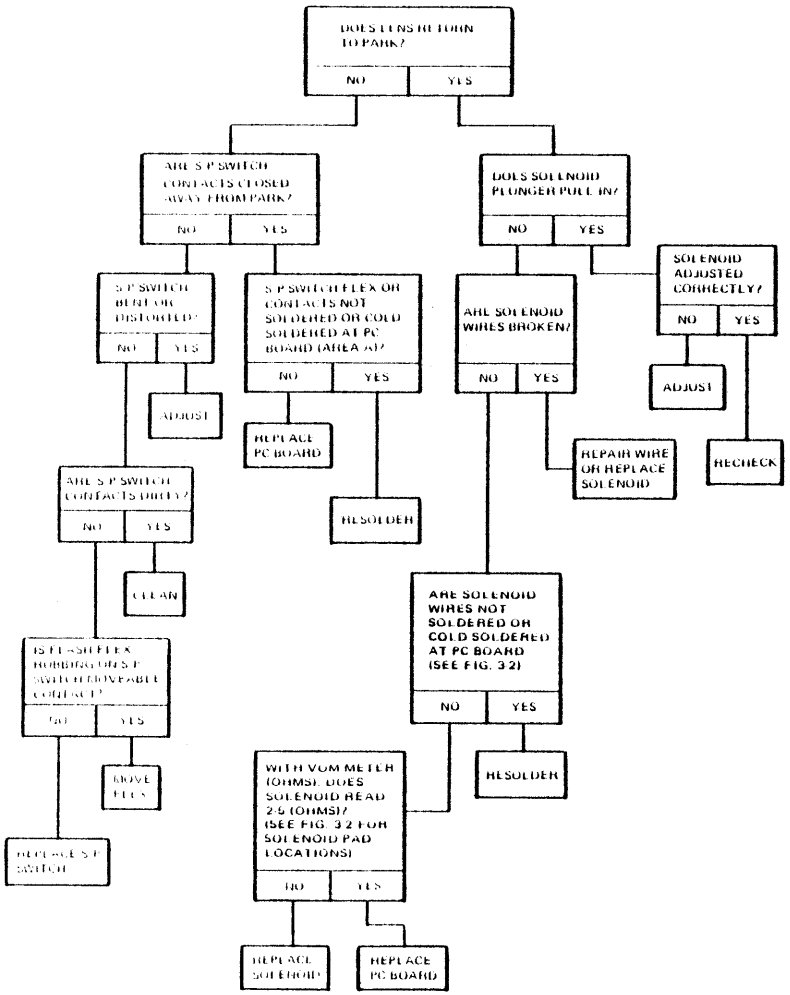
PICKOFF TEST

VOM ON HIGHEST RESISTANCE SCALE.

1. RED LEAD ON YELLOW AND BLACK LEAD ON ORANGE. THERE SHOULD BE A METER DEFLECTION.
2. RED LEAD ON BLUE AND BLACK LEAD ON GREEN. THERE SHOULD BE A METER DEFLECTION.

SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #5

COASTS WHEN RANGING*



*GOES BEYOND FOCUSED DISTANCE

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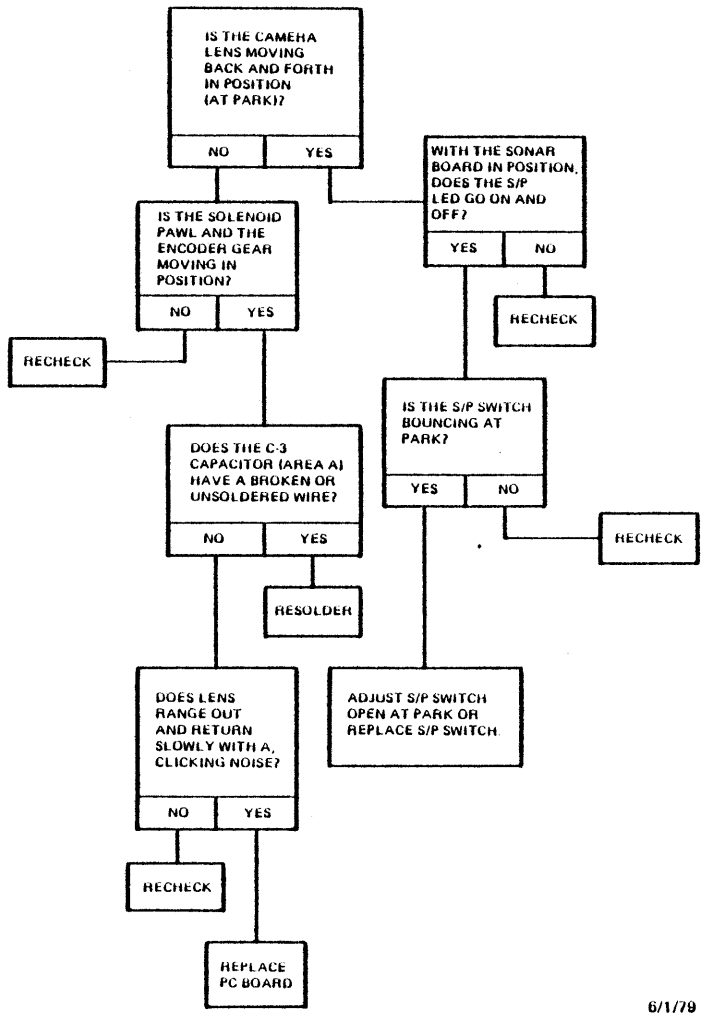
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #6

CHATTER BEFORE AND AFTER RANGING



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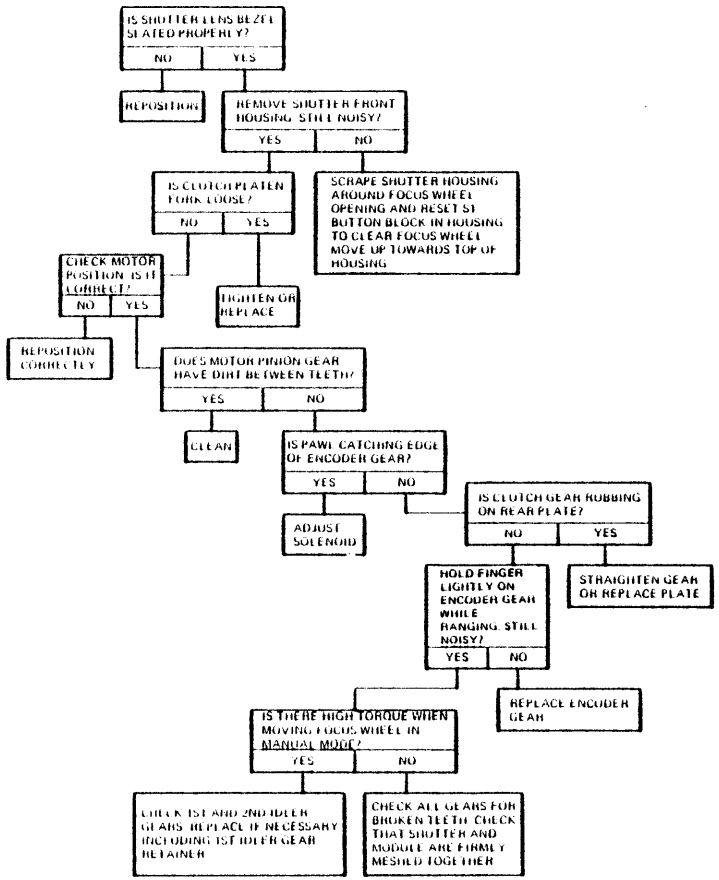
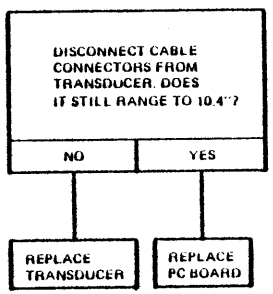
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #7

NOISY RANGING



SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #8

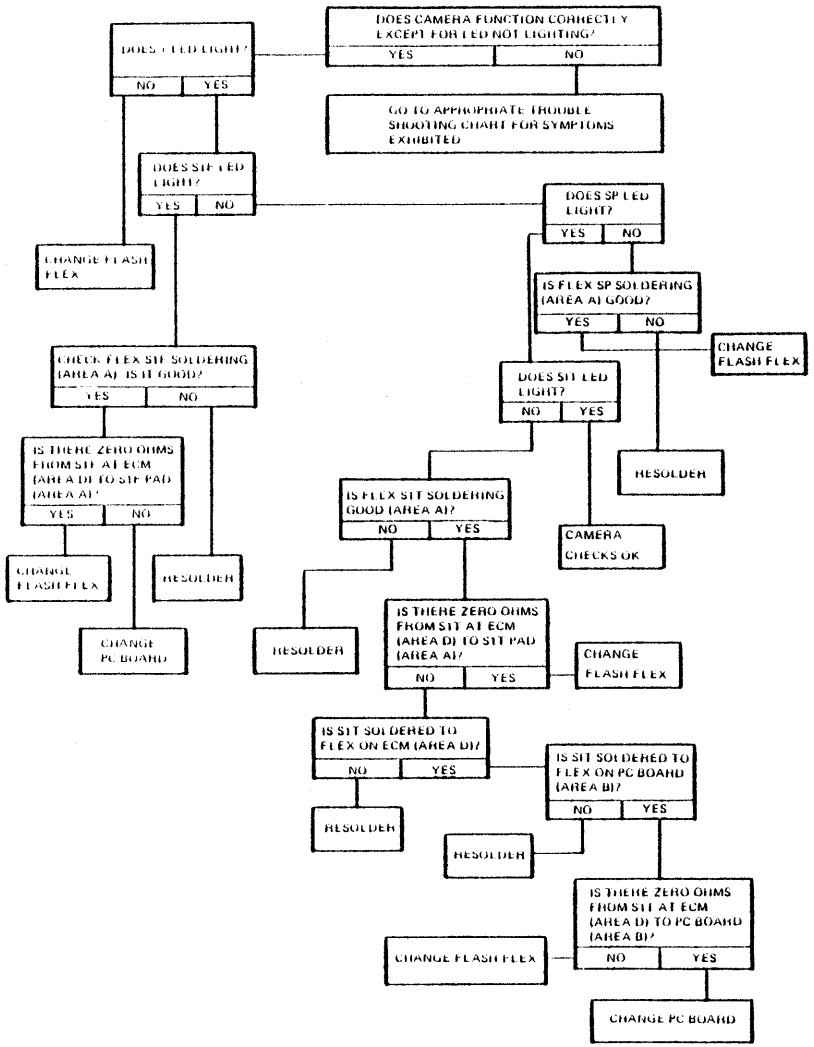
RANGES TO 10.4" ONLY (RINGING)



NOTE: USE POWER SUPPLY VOLTAGE 5.8V TO CHECK (RANGES TO 10.4" ONLY). LOW BATTERY VOLTAGE CAN CAUSE RINGING PROBLEMS.

SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #9

SONAR TEST BOARD LEDS DO NOT LIGHT



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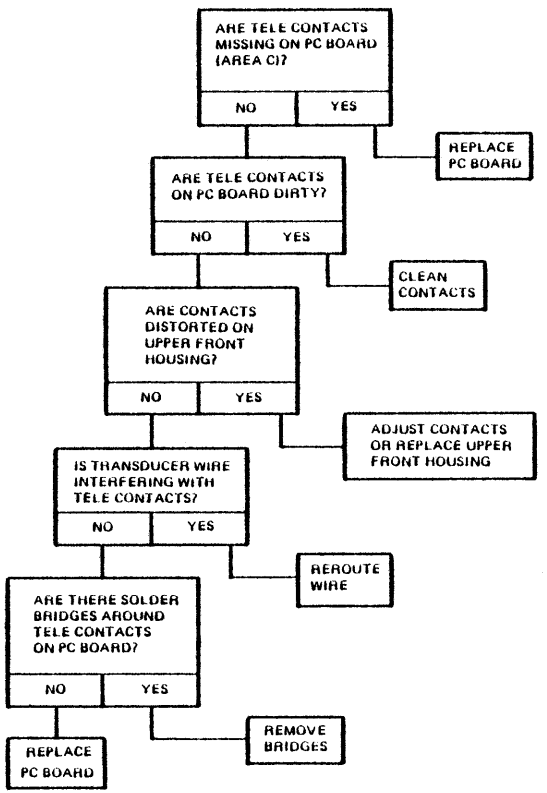
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART # 10

NO TELEPHOTO



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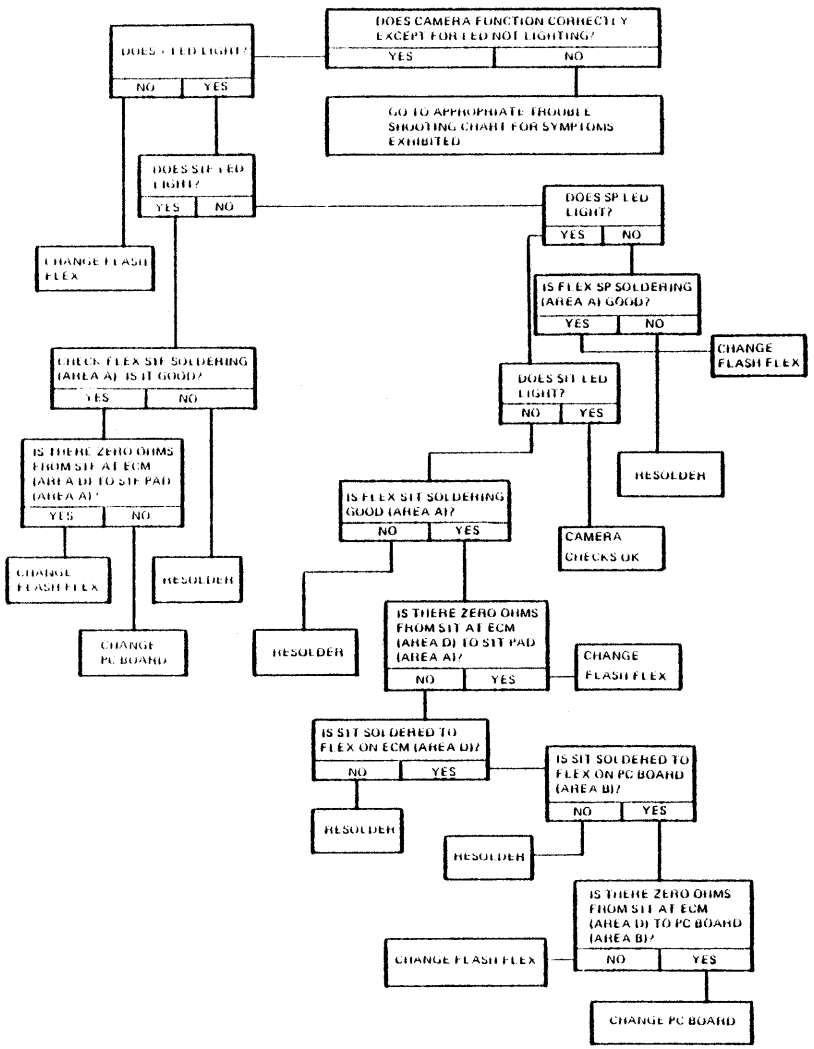
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #9

SONAR TEST BOARD LEDS DO NOT LIGHT



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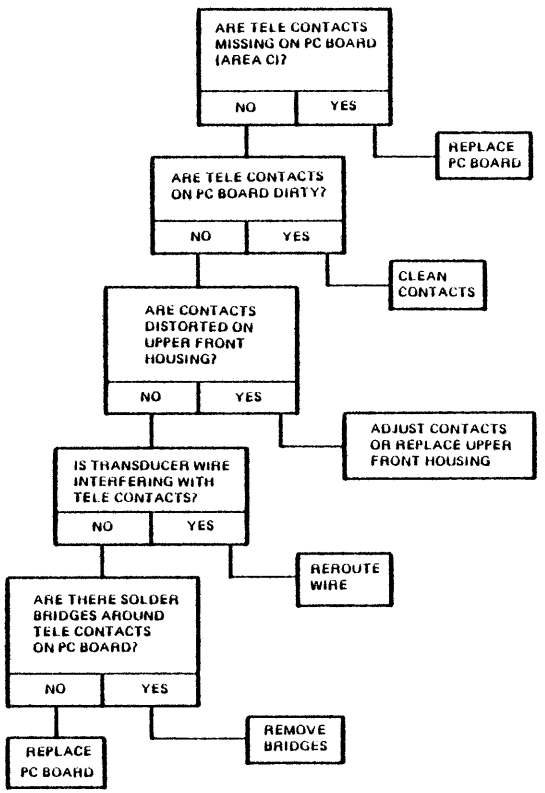
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART # 10

NO TELEPHOTO



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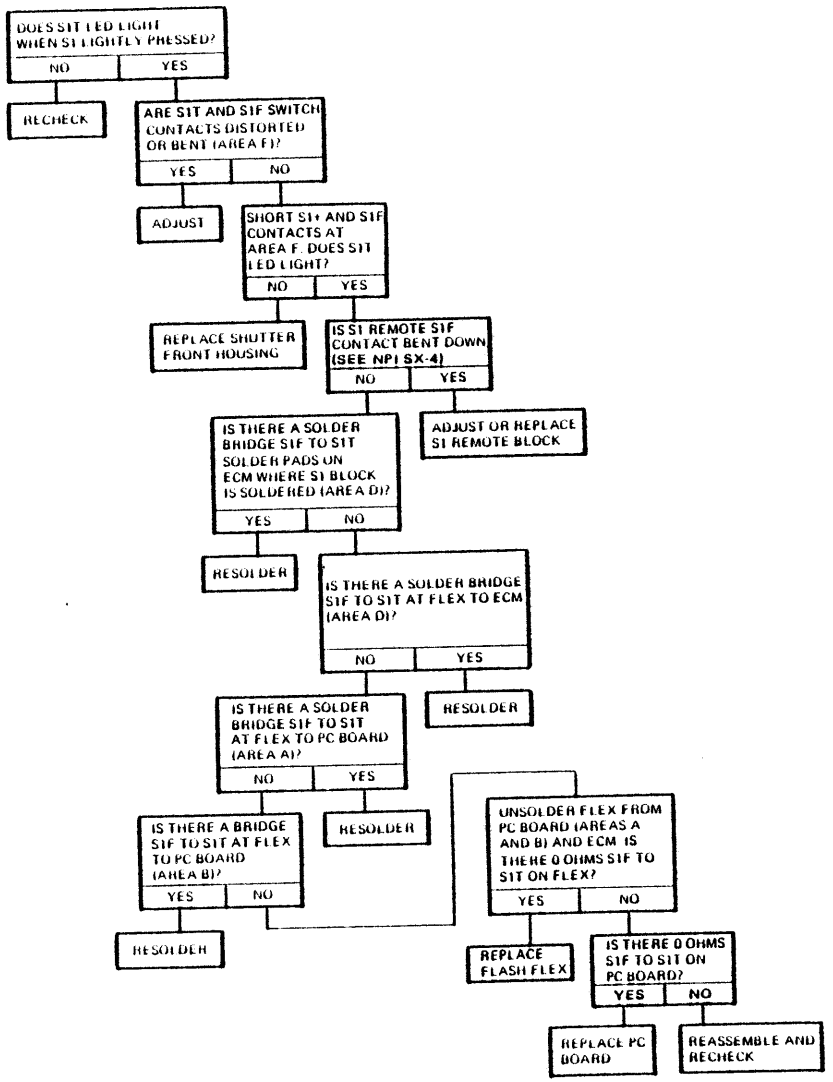
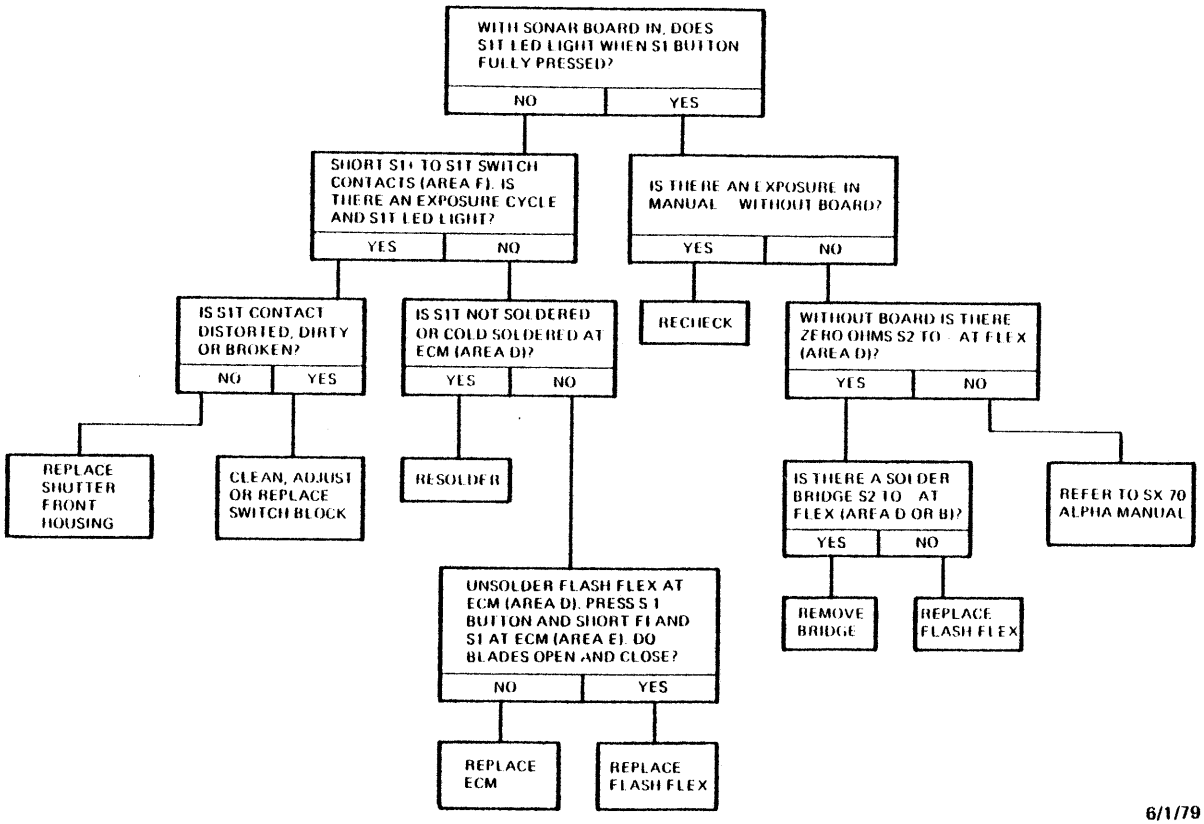
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #11

NO PREVIEW, RANGES AND EXPOSURE CYCLE AT SLIGHT TOUCH OF S1 BUTTON



SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #12

RANGES IN AUTO BUT NO EXPOSURE (WITHOUT SONAR TEST BOARD)



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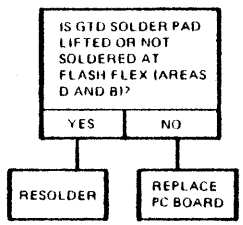
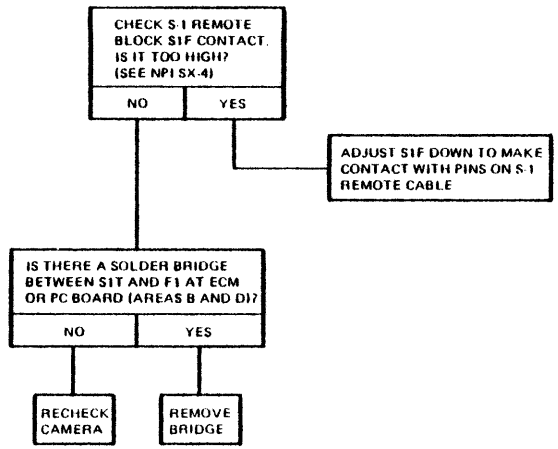
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #13

LENS RETURNS TO PARK DURING EXPOSURE



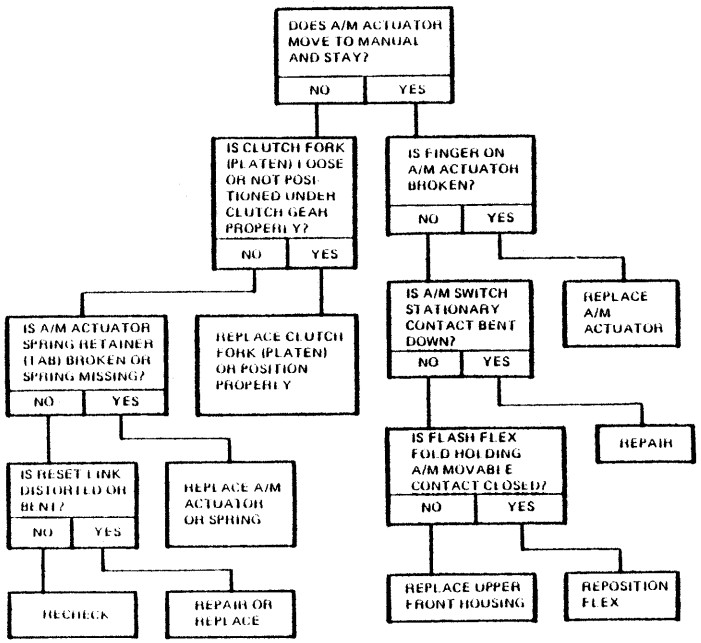
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #14

NO RANGE IN REMOTE



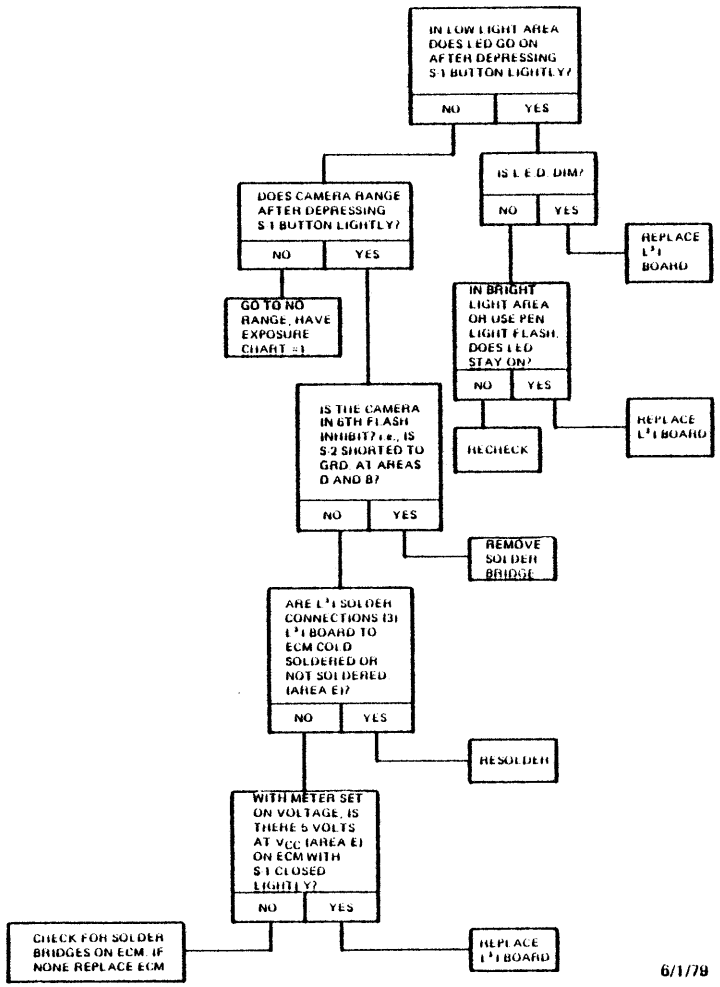
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #15

INCORRECT MANUAL MODE



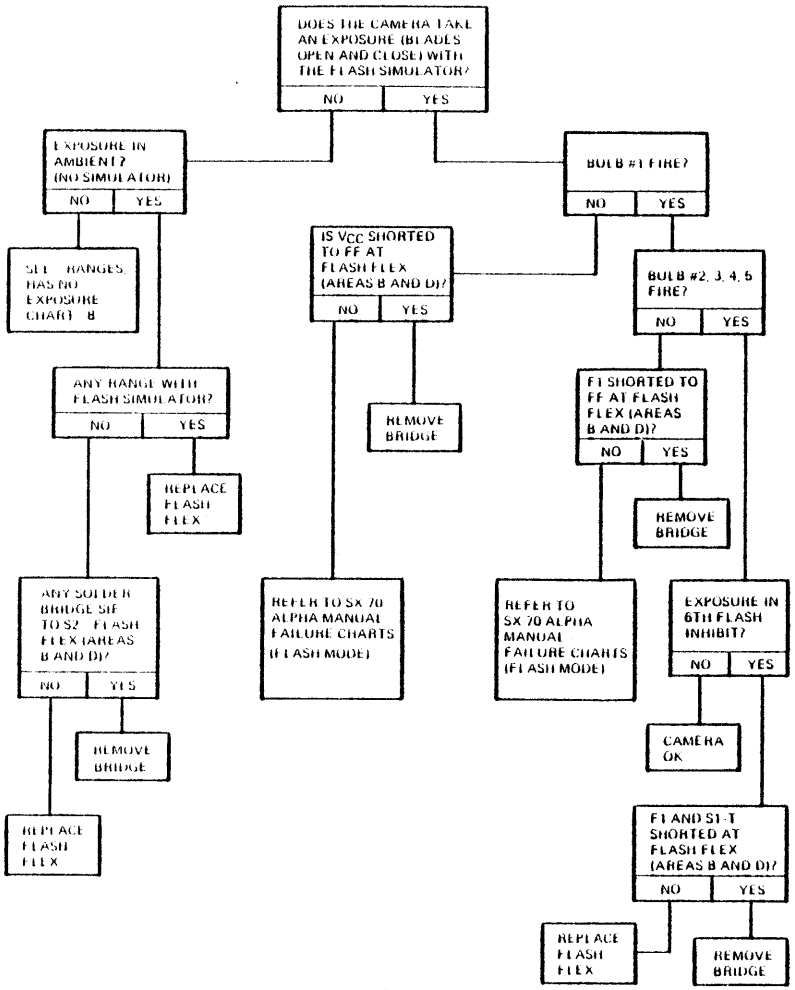
SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #16

INCORRECT L^{3}I LIGHT



SX-70 SONAR ONE STEP TROUBLESHOOTING CHART #17

FLASH PROBLEMS IN AUTOMATIC



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IV - DISASSEMBLY/REASSEMBLY OF SX-70 SONAR MODULE

The SX-70 Sonar OneStep is essentially an SX-70 camera to which the sonar module assembly has been added. So before working with the SX-70 sonar module, you should be thoroughly familiar with the SX-70 itself. Then use this manual as a guide for the disassembly and reassembly of the sonar module.

You'll probably stick pretty close to the manual the first few times you go through the steps. After a while, though, you'll develop a "feel" for the way the various parts of the sonar module fit together, and you'll develop your own techniques for working with it. Just be certain that none of your procedures damage the camera or degrade its performance. And keep this guide handy as a reference.

REMOVING THE UPPER HOUSING

1. Rotate focus wheel clockwise to the "infinity" position.
2. Push actuator button to its "automatic" setting. In that setting, it overhangs the focus wheel, making the wheel inaccessible.

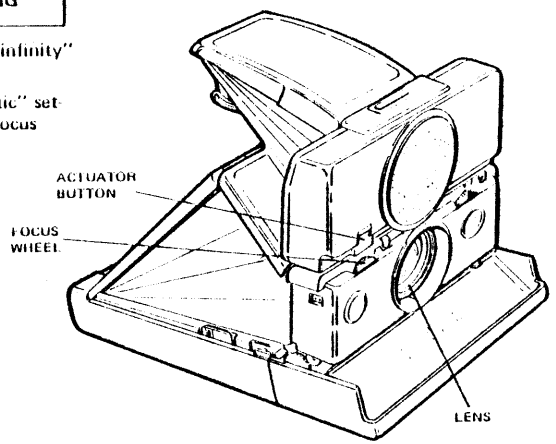


FIGURE 4-1

3. Apply viewfinder cap retainer (Tool #12404) to hold viewfinder in closed position.
4. Using soldering aid (Tool #3518), pry each side of the upper housing free of the shutter front housing. This step requires freeing the tabs on the bottom of the upper housing from the retainers on the top of the shutter front housing (see detail).

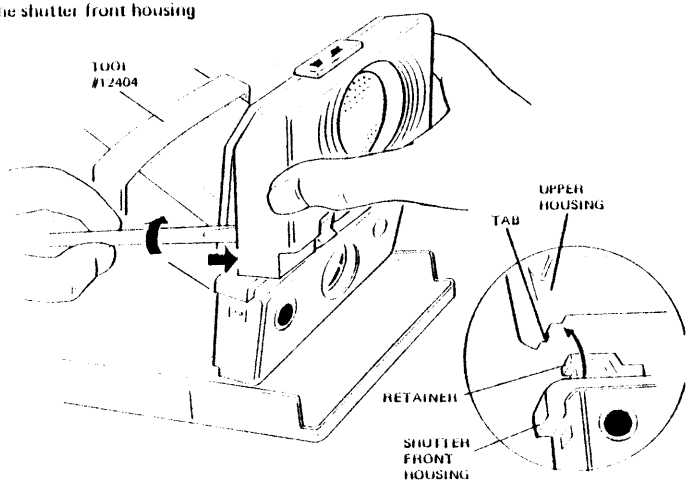


FIGURE 4-2

5. Rotate upper housing about 45 degrees, taking care not to snap off detents at top. Lift the housing free.

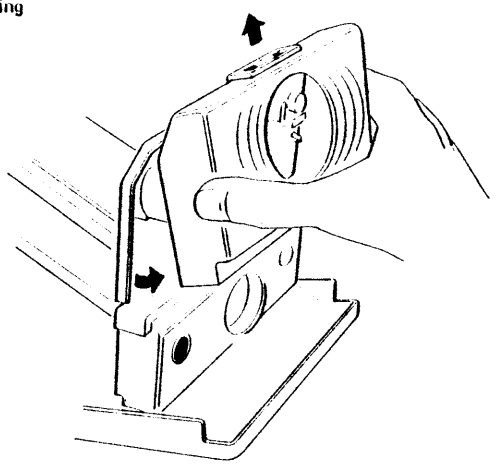


FIGURE 4-3

REMOVING THE TRANSDUCER

1. Pull bridge from two tangs holding it to front plate. Bridge falls free from transducer.
2. To remove transducer, unhook it from tang at bottom of front plate (see detail).
3. Detach ground and hot lead wires from transducer.

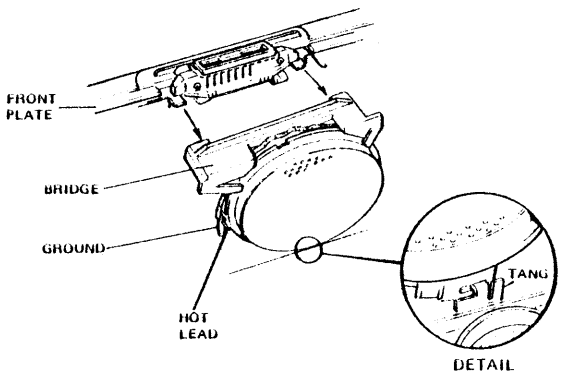


FIGURE 4-4

REMOVING THE MOTOR

NOTE: The next three illustrations show how to remove the motor. However, the motor can stay in place unless it is being replaced, since it does not interfere with rest of disassembly procedure.

1. Unsolder red and black wire leads from the sonar module P.C. board.

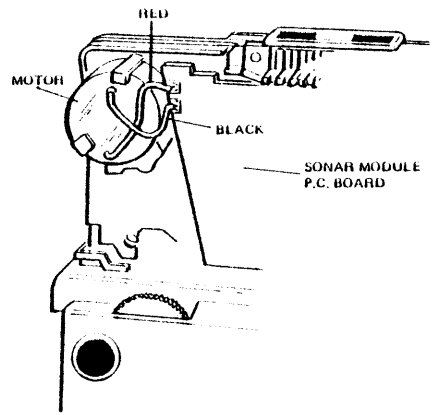


FIGURE 4-5

2. Spread two posts, using soldering aid (Tool #3518) or equivalent.

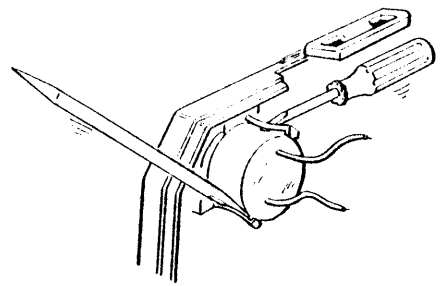


FIGURE 4-6

3. Pull motor out.

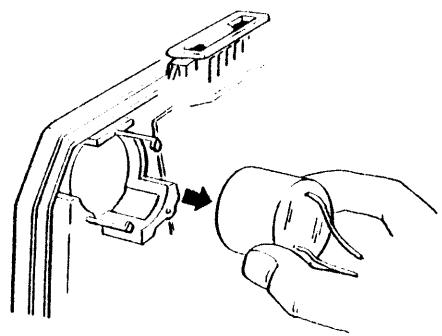


FIGURE 4-7

REMOVING THE FLASH SOCKET

1. Remove two screws holding flash socket to back cover.
2. Socket springs away.

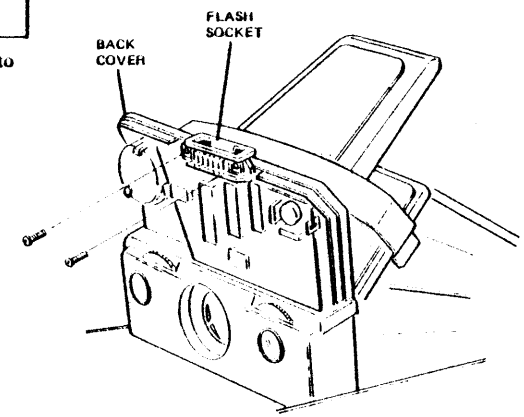


FIGURE 4-8

REMOVING THE BACK COVER

1. Turn camera around.
2. Use thumb to move socket away from back cover, thus disengaging the two bosses on the socket from the back cover.
3. With soldering aid (Tool #3518), pry each side of back cover at bottom to free from bubbles on each side of shutter base plate. Rotate tool to walk cover past bubbles.

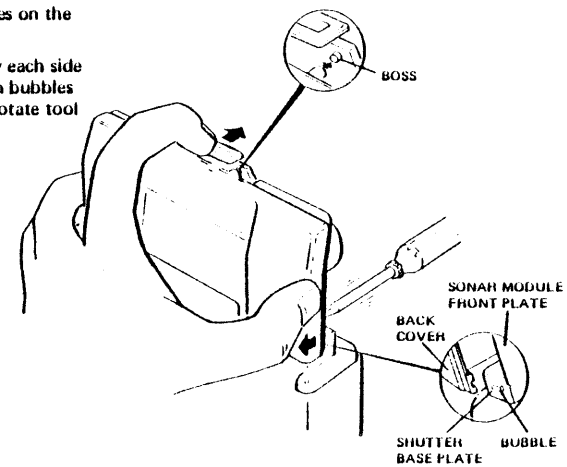


FIGURE 4-9

4. Lift back cover straight up.

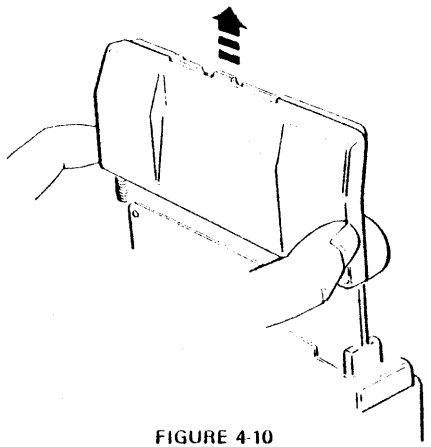


FIGURE 4-10

REMOVING THE SONAR MODULE

1. Fit screwdriver with finder (Tool #12403) over the adjustment cam, and rotate cam approximately 90 degrees to the right (facing camera) to unlock it (see detail). Cam does not show through the opening at start, but does show after rotation.
2. Remove two screws at bottom of assembly, holding the assembly to the shutter base plate.
3. Pull assembly up.

CAUTION: **Use care to prevent damaging the flex circuit which still connects the sonar module to the shutter assembly.**

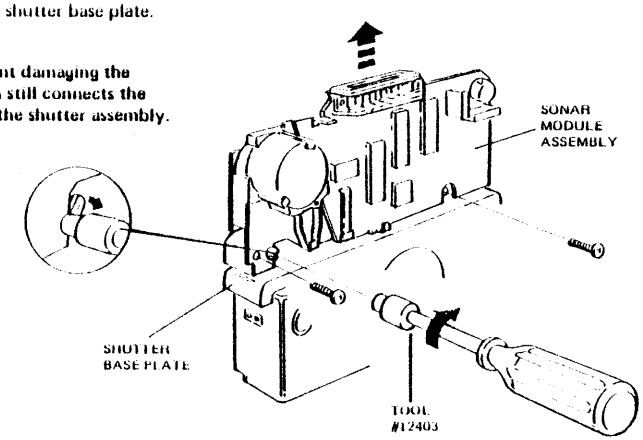


FIGURE 4-11

DISASSEMBLING THE SONAR MODULE

NOTE: For clarification purposes, the shutter assembly is not shown in the following illustrations. However, it is still connected to the sonar module by the flex circuit. Be careful to avoid damaging the flex circuit.

1. To remove rear plate, use square-bit screwdriver (Tool #11913) to remove two machine screws and one self-threading screw.

   NOTE: Be sure to return self-threading screw to same location during reassembly.

2. Lift rear plate gently to avoid spilling gears beneath.

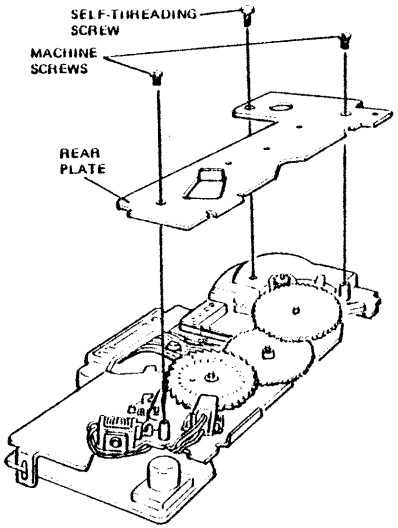


FIGURE 4-12

3. To remove the pick-off assembly, go between the front plate and encoder wheel with a small screwdriver. Simultaneously press down on the pick-off retainer of the front plate and pull off the pick-off assembly (see detail).

CAUTION: **Do not press against the encoder wheel with the screwdriver.**

NOTE: Go to Figure 4-26 or 4-27 for disconnecting pick-off leads.

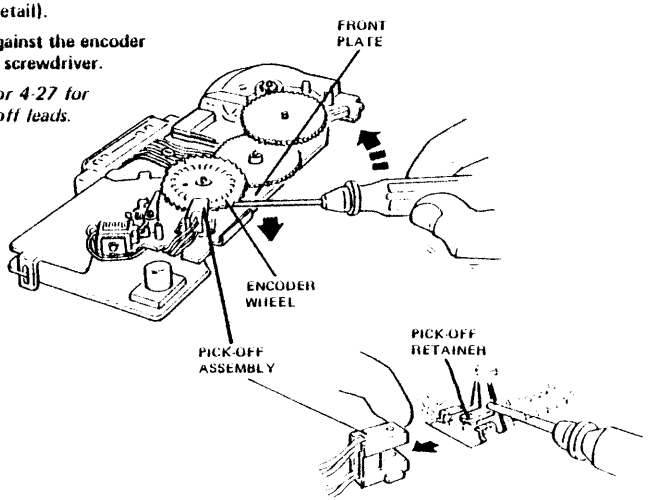


FIGURE 4-13

4. Remove the encoder wheel.

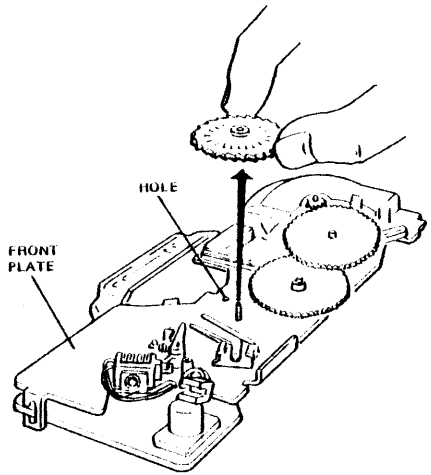


FIGURE 4-14

5. Remove the second idler gear and clutch drive gear together, since the second idler gear meshes with the clutch pinion on the backside of the clutch drive gear.

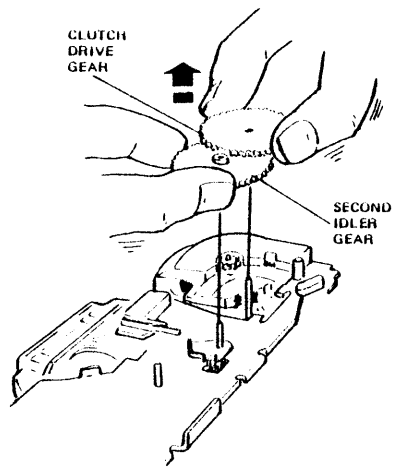


FIGURE 4-15

6. Remove stop spring from second idler gear shaft with tweezers.

NOTE: When reassembling, be sure stop spring is put on shaft right side up, with the notch in the spring fitting over the indexing key.

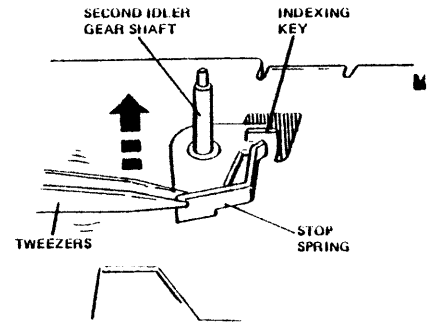


FIGURE 4-16

7. Figure 4-17 shows the pawl, pawl-encoder spring, and clapper solenoid assembly before they are removed from front plate. Notice how spring is hooked to front plate.

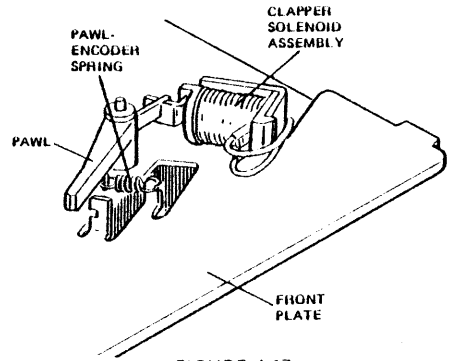


FIGURE 4-17

8. Remove pawl and pawl-encoder spring together with two pairs of tweezers. When unhooking end of spring from front plate, be careful that spring does not fly off. Also keep tension on spring during removal, so spring does not fall off pawl.

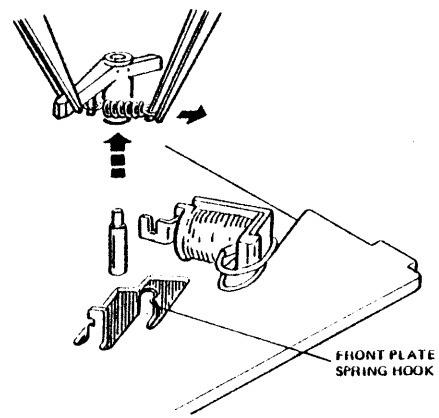


FIGURE 4-18

9. To remove clapper solenoid assembly, use midget nut driver (Tool #3517) to loosen cap screw. Assembly falls away. See Figures 4-26 and 4-27 for location of solenoid terminals on P.C. board.

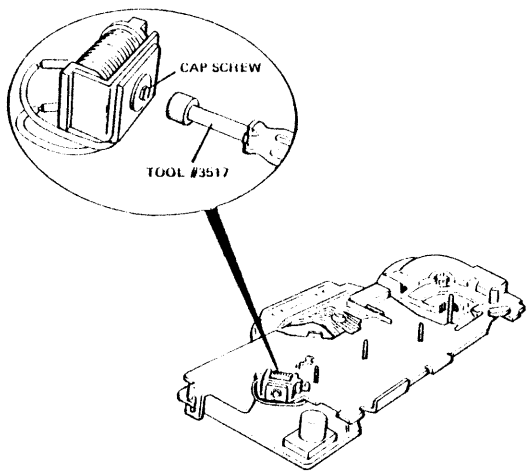


FIGURE 4-19

REASSEMBLING THE SONAR MODULE

Reassembly starts here. We'll refer to earlier figures to help you.

1. Replace the stop spring on the second idler gear shaft on the front plate (see Figure 4-16).
2. Replace the second idler gear and clutch drive gear (see Figure 4-15).
3. Replace clapper solenoid assembly (see Figure 4-19). Be sure to position it with the solenoid frame placed against the tang with the screw hole. Insert cap screw and temporarily tighten with the midget nut driver (Tool #3517).
4. Replace pawl and pawl encoder spring (see Figure 4-18). Insert short tongue of pawl into cutout in clapper on solenoid, and drop pawl onto shaft adjacent to solenoid. Hold spring in tweezers at an angle of 90 degrees for convenience. Attach one end of spring to the post on the underside of the pawl. Carefully attach the other end to the hook on the front plate, adjacent to the pawl, with the groove facing away from the pawl. The ends of the spring are interchangeable.
5. Before replacing encoder wheel, turn second idler gear counterclockwise until it stops. Hold the gear with your thumb. The park switch will be open. Line up encoder wheel so that hole in wheel overlays hole in front plate (see Figure 4-14). Drop wheel onto shaft.

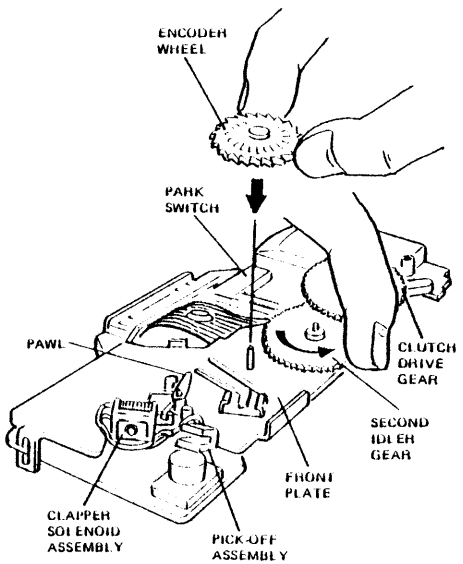


FIGURE 4-20

6. Check that encoder wheel is mounted correctly: Pawl will be in fourth tooth of wheel, taking the tooth nearest the hyperfocal dot as zero.
7. Adjustment of solenoid, which in turn adjusts pawl: Adjust solenoid so that pawl just clears teeth of encoder wheel. Tighten cap screw with midget nut driver (Tool #3517). On pushing short tongue of pawl attached to clapper, against solenoid, pawl should snap back into position.

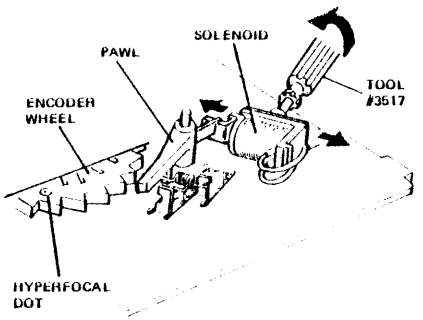


FIGURE 4-21

8. Slide pick-off assembly between two tangs on front plate and back over encoder wheel until assembly clicks into place.
9. Replace rear plate (see Figure 4-12). Line up the four shafts through the holes in the plate. The two shoulders supporting the rear plate will show through. Return self-threading screw and the two machine screws to their original locations.

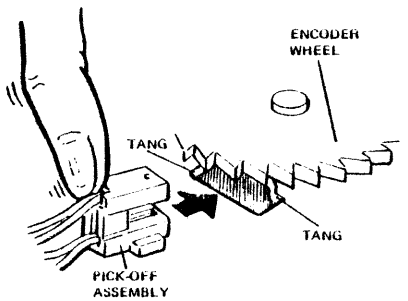


FIGURE 4-22

10. Turn encoder wheel until the tooth marked with the straight line (the 8-foot focus mark) is in line with the pawl. Push pawl in against the tooth and lock there with actuator clip (Tool #57).

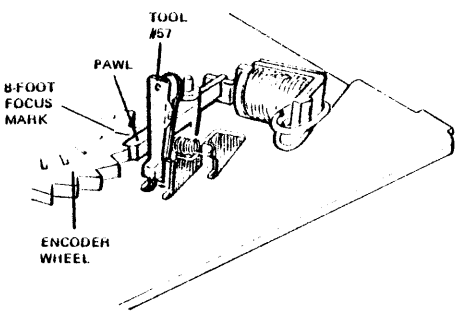


FIGURE 4-23

INSTALLING THE SONAR MODULE

1. Rotate focus wheel to check movement, then use focus wheel to set lens focal length at 8 feet, as shown on scale beneath lens opening on shutter front housing. (This setting matches encoder wheel-pawl setting.) Tape focus wheel to prevent moving.
2. Reattach sonar module assembly to top of shutter front housing and to shutter base plate (see Figure 4-11). Replace the two 5/16-inch brass screws at bottom of assembly, but keep loose to allow meshing of gears.
3. Press sonar assembly into shutter assembly, meshing second idler and first idler gears. Lock adjustment cam (see Figure 4-11) and tighten two brass screws. Remove Tool #57 and tape from focus wheel.
4. Spin focus wheel several times, and return to 8-foot mark on shutter lens. Check encoder wheel to be sure the 8-foot mark still lines up with the pawl. If not, go back to Figure 4-23 and work through again. Be sure Tool #57 and the tape on the focus wheel do not slip.

   NOTE: When you turn focus wheel toward infinity setting, you'll be slightly beyond the infinity mark on the scale when you reach the stop. This is the "park" position. The park switch will be open.

INSTALLING THE BACK COVER, FLASH SOCKET, MOTOR, TRANSDUCER, AND UPPER HOUSING

1. Move back cover vertically down onto shutter base plate until it snaps into place over the two bubbles on each side of the base plate (see Figure 4-8).
2. Reattach flash socket with two self-threading screws (see Figure 4-8).
3. Push the motor into position under the two plastic posts (see Figures 4-6 and 4-7). Solder the red and black leads to the terminals on the P.C. board (see Figure 4-5).
4. Reattach black transducer cable with the two push-on connectors to transducer. Wrap cable around top of transducer, along flange at back. Reattach the two push-on connectors to the transducer (Figure 4-4).

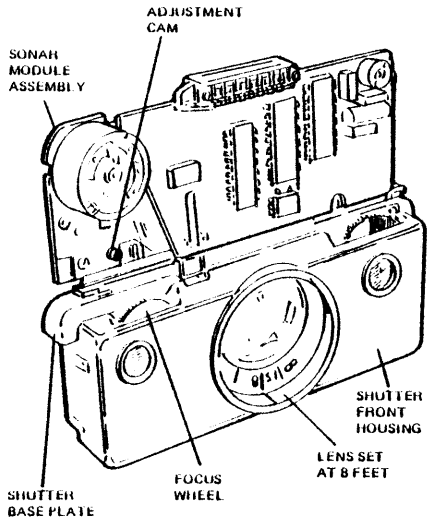


FIGURE 4-24

5. Marry bridge to transducer. Bridge will capture the cable wrapped around transducer. Push bridge onto two tangs holding it to front plate (see Figure 4-4).
6. To reattach upper housing, first turn focus wheel to "park" position. Set actuator button on housing to "automatic" position (otherwise, you may destroy the automatic-manual switch on the sonar module). The two tangs on the inside back of the upper housing must line up with the slots in the back cover. Slip the tangs into the slots by holding the housing at 90 degrees with the back cover. Swing housing down until it snaps into place. (See Figures 4-2 and 4-3).

REMOVING THE FLASH FLEX CIRCUIT ASSEMBLY OR SONAR P.C. BOARD

1. Follow procedures in SX-70 MANUAL to remove leather cover, four screws from bottom cover, bottom cover, eight flex leads, and four shutter screws. These procedures separate the shutter and sonar module from the basic camera.
2. Remove upper housing (see Figures 4-1 through 4-3). Remove transducer and bridge (see Figure 4-4). Unsolder two motor leads at sonar module P.C. board (see Figure 4-5). Remove two screws holding flash socket to back cover (see Figure 4-8). Remove back cover (see Figures 4-9 and 4-10). This leaves sonar module assembly attached to shutter base plate.
3. Separate sonar module assembly from shutter base plate (see Figure 4-11). At this point, the flex is still attached to the shutter P.C. board and flash socket.

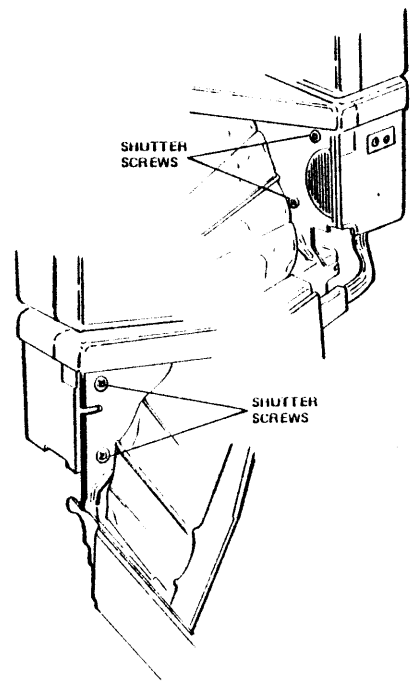


FIGURE 4-25

(These next two figures deal with the "old" and "new" versions of the sonar P.C. board. The old uses soldered connections, and the new uses both soldered and snap-in connections. Notice that locations of the leads differ on the two versions.)

4. Unsolder the following leads on sonar P.C. board: park switch, pick off assembly, and clapper solenoid assembly. Bend park switch leads back (see detail).

NOTE: When resoldering leads, make sure leads from pick off are resoldered to correct contacts, and that park switch leads are bent forward before soldering.

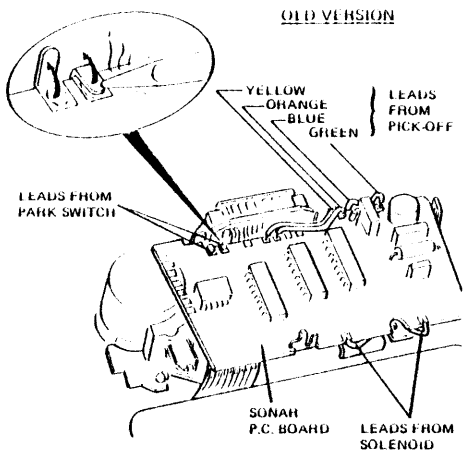


FIGURE 4-26

4a. Unsolder leads from park switch, and bend leads back (see detail). Pull out snap-in connectors of pick off and solenoid.

NOTE: When reconnecting leads, make sure leads from pick-off and solenoid are attached to correct contacts, and that park switch leads are bent forward before soldering.

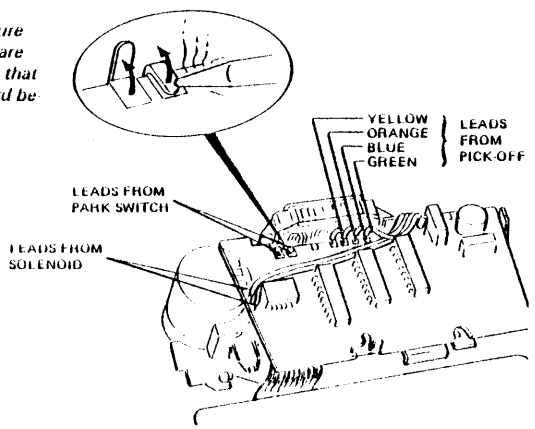


FIGURE 4-27

5. Lift the board off the pin and then push left on sonar P.C. board to release it from the retainer on the front plate.

6. Rock P.C. board forward, taking care not to damage the flash flex ribbon cable.

NOTE: When reassembling, be sure P.C. board is firmly connected to front plate retainer.

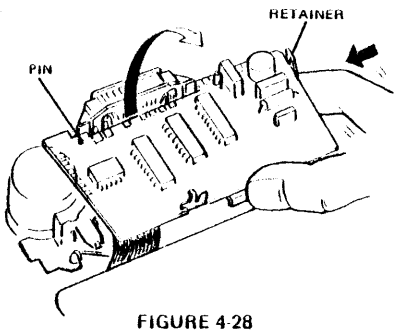


FIGURE 4-28

NOTE: At this point, the park switch may be replaced, if necessary.

7. To remove park switch from front plate, cut off plastic staked heads with x-acto knife, and pull switch off.

7a. To replace park switch, push stakes on switch through holes on front plate. If enough material remains on plastic stakes, fix switch to plate with soldering iron. Otherwise, use epoxy resin.

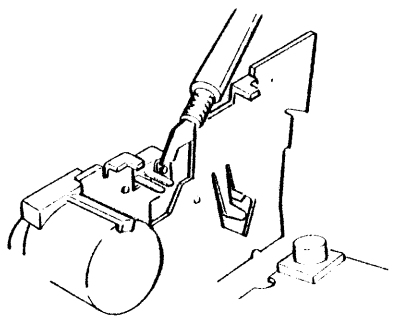


FIGURE 4-29

8. Unsolder the eight contacts of the flash flex circuit assembly at the rear of the shutter P.C. board. Lift pads as you unsolder. The yellow insulating strip stays in place.

9. Free flash flex circuit assembly from shutter base plate by gently pulling it through slot in plate.

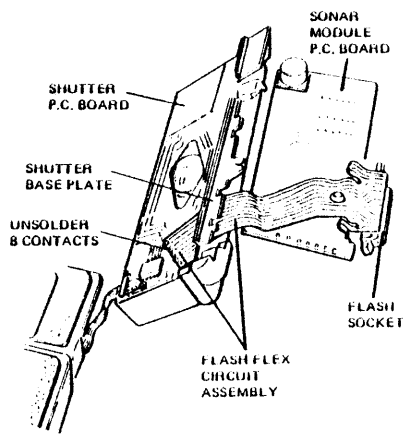


FIGURE 4-30

CAUTION: In the following step, use care to prevent splitting the flex. If the flex is damaged in the unsoldering process, it must be replaced.

10. Fold flex circuit up, as shown below, and unsolder the eight contacts on the back of the sonar P.C. board.
11. Unsolder the three switch contacts.
12. The flash flex and socket assembly is now free.

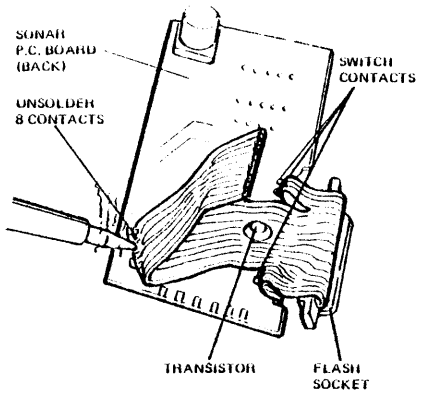


FIGURE 4-31

INSTALLING THE FLASH FLEX AND SONAR P.C. BOARD

1. Replace the old sonar P.C. board with a new one, if necessary, at this point. Unsolder the leads of the transducer cable on the old sonar P.C. board and resolder them onto the new board (see Figure 4-32).
2. To attach a new flash flex circuit assembly (including flash socket), first be sure that the round side of the transistor in the circuit assembly adjacent to the flash socket is facing upward (not the rectangular side).
3. Solder the eight contacts on the back of the sonar P.C. board (see Figure 4-31).
4. Solder the three switch contacts (two on one side, one on the other side of the flex circuit) (see Figure 4-31).

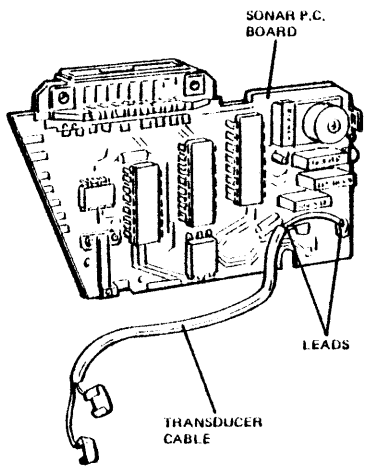
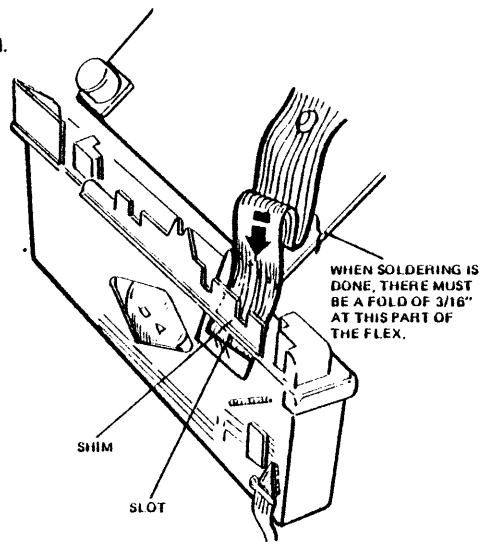


FIGURE 4-32

5. Place piece of shim stock, about 9/16 inch by 1-3/4 inches, in the slot of the shutter base plate. Feed flex circuit past the shim and through the slot, using shim as a guide.
6. When you reach offset part of the flex, gently pull flex sideways and forward at same time (see detail), until bend is worked through slot. The eight contacts on the flex will line up with the contacts on the shutter P.C. board when the flex has been pulled through far enough.
7. Reattach the sonar module assembly to the shutter assembly (see Figures 4-11 and 4-24).
8. Solder the eight contacts on shutter P.C. board. Remove the shim.
9. Reassemble the sonar module and shutter assembly to the camera (see Figure 4-28, 4-27, 4-26 and 4-25).



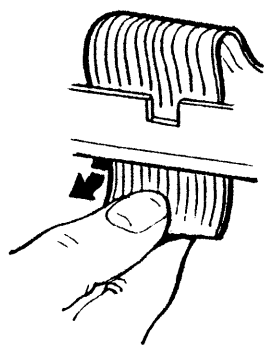


FIGURE 4-33

REMOVING THE LOW LIGHT LEVEL INDICATOR (L^3I) BOARD

1. Open camera. Drop front door and remove.
2. Set actuator button on "MANUAL", and move focus wheel to "INFINITY" (see Figure 4-1).
3. Remove upper housing (see Figures 4-2 and 4-3).
4. Use soldering aid (Tool #3518) or a standard small screwdriver to pry shutter front housing over tabs on each side of the back of the shutter base plate (see Figure 4-34). Pry housing over tabs on each end of the shutter base plate. Remove shutter front housing.
5. Remove four shutter hinge bracket screws (see Figure 4-34).
6. Place sonar and shutter module assembly on side of camera.

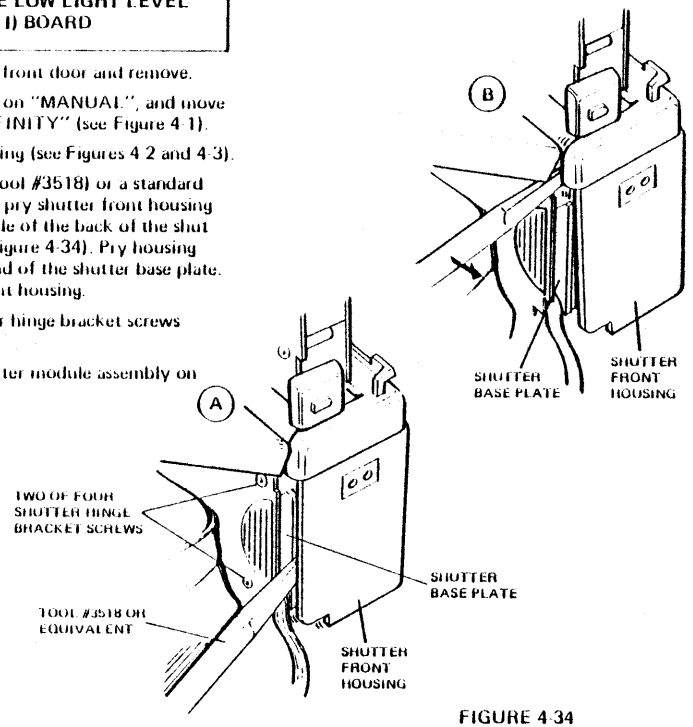


FIGURE 4-34

7. Remove two screws holding trim assembly to shutter module. Remove trim assembly.

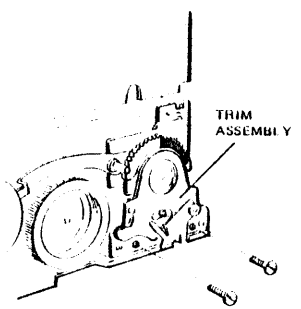


FIGURE 4-35

8. Unsolder three leads from back of shutter P.C. board. Bend them gently about 90 degrees to straighten them (see detail).

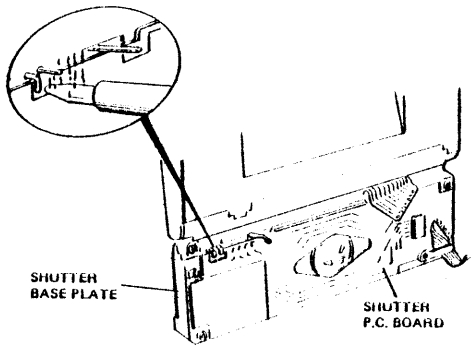


FIGURE 4-36

9. Remove trim link retainer. Push trim link aside.

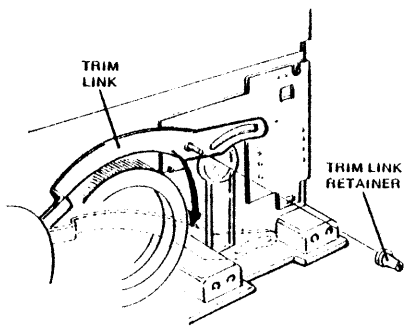


FIGURE 4-37

10. Cut off two plastic pinheads with x-acto knife.

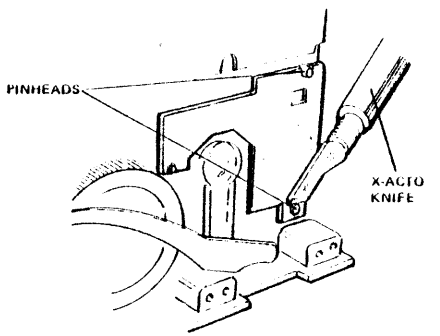


FIGURE 4-38

11. Remove low light level indicator (L^3I) board.

INSTALLING THE LOW LIGHT LEVEL INDICATOR (L^3I) BOARD

1. To install new L^3I P.C. board, insert the three leads on the back of the board through the openings in the shutter base plate. Keep the two leads dressed going through the small holes on the base plate, so they will fit easily. Push the L^3I board up against the two plastic pins on the shutter base plate.
2. Bend the leads down about 90 degrees and solder to back of shutter P.C. board (see Figure 4-36).

   If enough material is left on the two plastic pins, peen them over with the soldering iron. Otherwise, use epoxy resin.
3. Push trim link back, and put back trim link retainer (see Figure 4-37).
4. Put back trim assembly (see Figure 4-35).
5. Install four shutter hinge bracket screws to secure sonar module/shutter assembly to camera.
6. Put back shutter front housing. To do so easily, position cavities on inside top of housing against the two tabs on the shutter base plate, and press.
7. Put back upper housing and front door.

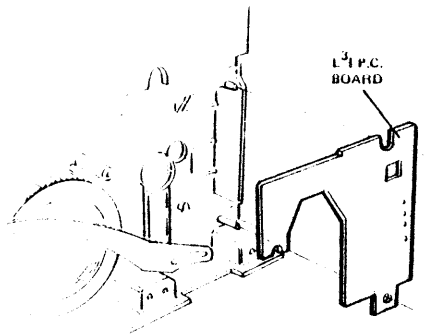


FIGURE 4-39

REMOVING FIRST IDLER GEAR

1. Follow steps in removal of L^3I P.C. board to remove upper housing, shutter front housing, trim assembly, and trim link retainer.
2. Loosen (but do not remove) the two screws at bottom of sonar module assembly, holding that assembly to the shutter base plate (see Figure 4-11). This allows access to the first idler gear.
3. Push trim link aside (see Figure 4-37).
4. The first idler gear and retainer lie exposed, as in Figure 4-40.

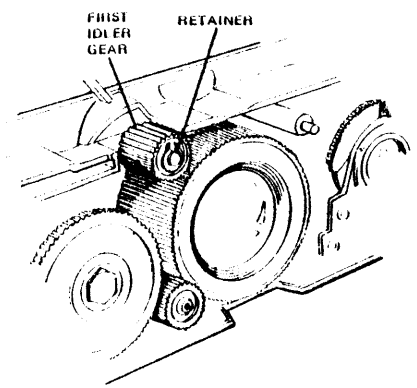


FIGURE 4-40

5. Remove retainer with E-ring retainer pliers (Tool #10666).

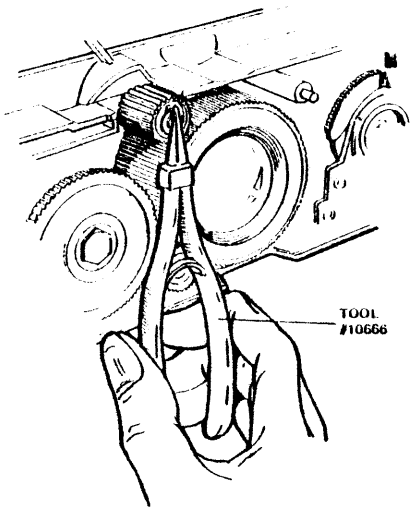


FIGURE 4-41

6. Lift out first idler gear.

INSTALLING FIRST IDLER GEAR

1. Replace with new gear.
2. Put back retainer.
3. Push back trim link.
4. Tighten the two screws holding the sonar module assembly to the shutter base plate.
5. Put back trim link retainer, trim assembly, shutter front housing, and upper housing.

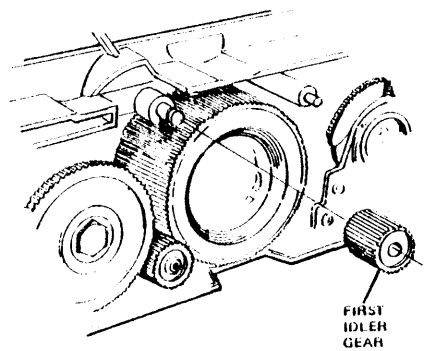
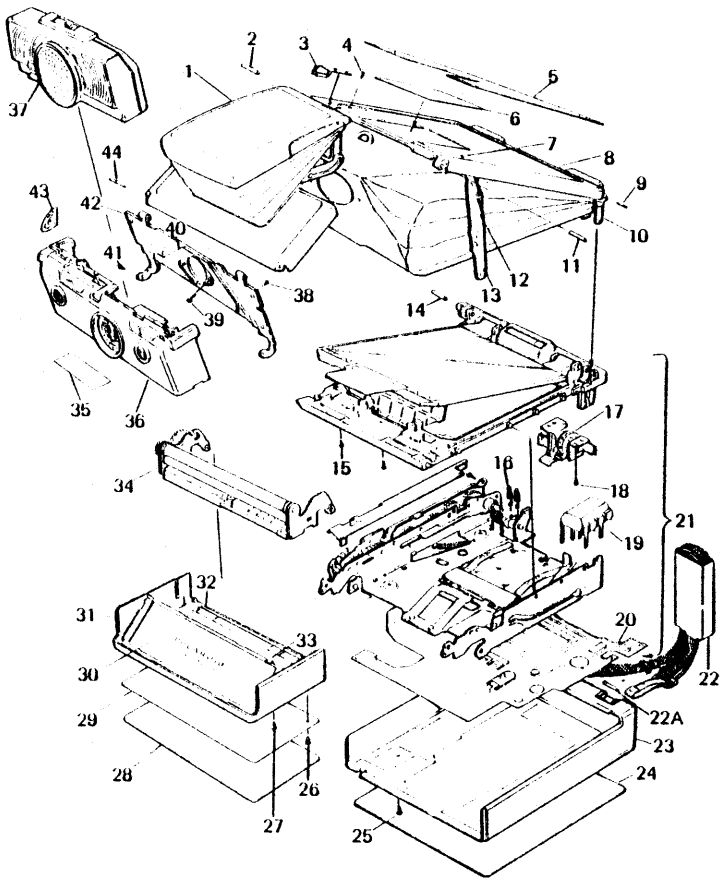


FIGURE 4-42

PLATE 1 CAMERA ASSEMBLY



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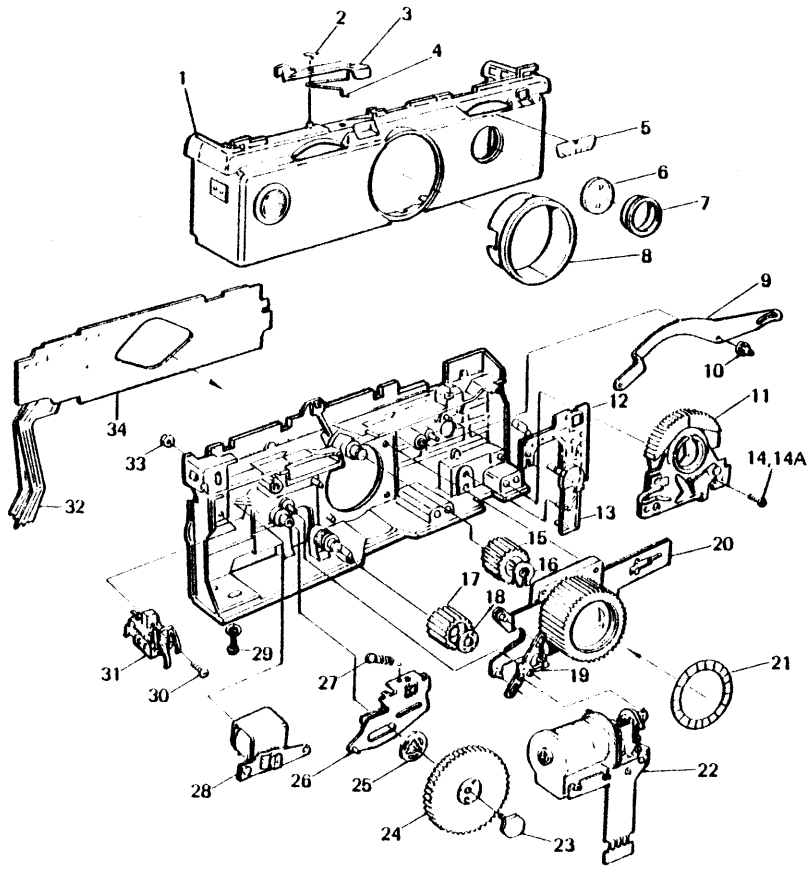
PARTS LIST 1 – CAMERA ASSEMBLY

Key No.	Part Name	Part Number* Sonar OneStep	Sonar OneStep SE	Sonar OneStep SE Export	AutoFocus International
1	SHORT COVER ASSEMBLY (See Plate 4)	—	—	—	—
2	Hinge Pin, Left (Mirror Cover to Short Cover)	705715			
3	Detent Insert	705831			
4	Screw, Detent Insert	705063			
5	Leather Insert, Mirror Cover	705186B	725145J	725145J	
6	Decal, Mirror Cover	705757E	705757G	705757H	705757F
7	Screw, Erecting Link (2)	705079			
8	MIRROR COVER ASSEMBLY	705446B	725291	725291	
9	Cam Pin, Safety Switch	705033			
10	Actuator, Safety Switch	705199			
11	Hinge Pin, Right (Mirror Cover to Short Cover)	705716			
12	Spring, Erecting Link	705724			
13	ERECTING LINK ASSEMBLY	705294			
14	Hinge Pin, Left (Mirror Cover)	705132			
15	Screw, Inner Frame (2)	705044			
16	Override Spring (2)	705902			
17	COUNTER ASSEMBLY	705863			
18	SCREW, COUNTER ASSEMBLY (6 spline, button head 0-48 x .13) (2)	705169			
19	Motor Control Module	705982			
20	Body Flex	725423A			
21	LOWER CAMERA BACK ASSEMBLY	725436C			
22	NECK STRAP PACKAGING ASSEMBLY (Nylon)	728306E			
22A	Clip Pin, Bright (2)	725382F			
23	BOTTOM COVER ASSEMBLY	725381K	725381M	725381M	
24	Leather Insert, Bottom Cover	705188C	725141P	725141P	
25	Screw, Bottom Cover (1-72 x .11) (4)	725411			
26	Rivet, Film Catcher Spring (4)	705895			
27	Screw, Front Cover (2)	705564			
28	Leather Insert, Front Cover	705189C	725142K	725142K	
29	Film Catcher Spring	705361			
30	Decal, Light Shield	725328H	725328K	725328K	725328J
31	FRONT COVER ASSEMBLY	705558H	725297I	725297I	
32	Decal, Front Cover	705758			
33	Cam, Light Shield	705386			
34	SPREAD SYSTEM ASSEMBLY	705998			
35	Label, Customer Assistance	725453			N/A
36	SHUTTER ASSEMBLY	726441H			
37	SONAR MODULE ASSEMBLY (with electronics) (See Plate 3)	—	—	—	—
38	Screw, Shutter Mounting	705973			
39	Rivet, Shutter Hinge Bracket to Boot	705955			
40	Lens Gasket	705894			
41	Rivet, Shutter Hinge Bracket	705639			
42	SHUTTER HINGE BRACKET ASSEMBLY	725012E			
43	Thumb Print Decal	725454			
44	Hinge Pin, Shutter Hinge Bracket to Short Cover	705717			

*Unless otherwise indicated, part number shown for Sonar OneStep applies to all models.

PLATE 2 SHUTTER ASSEMBLY



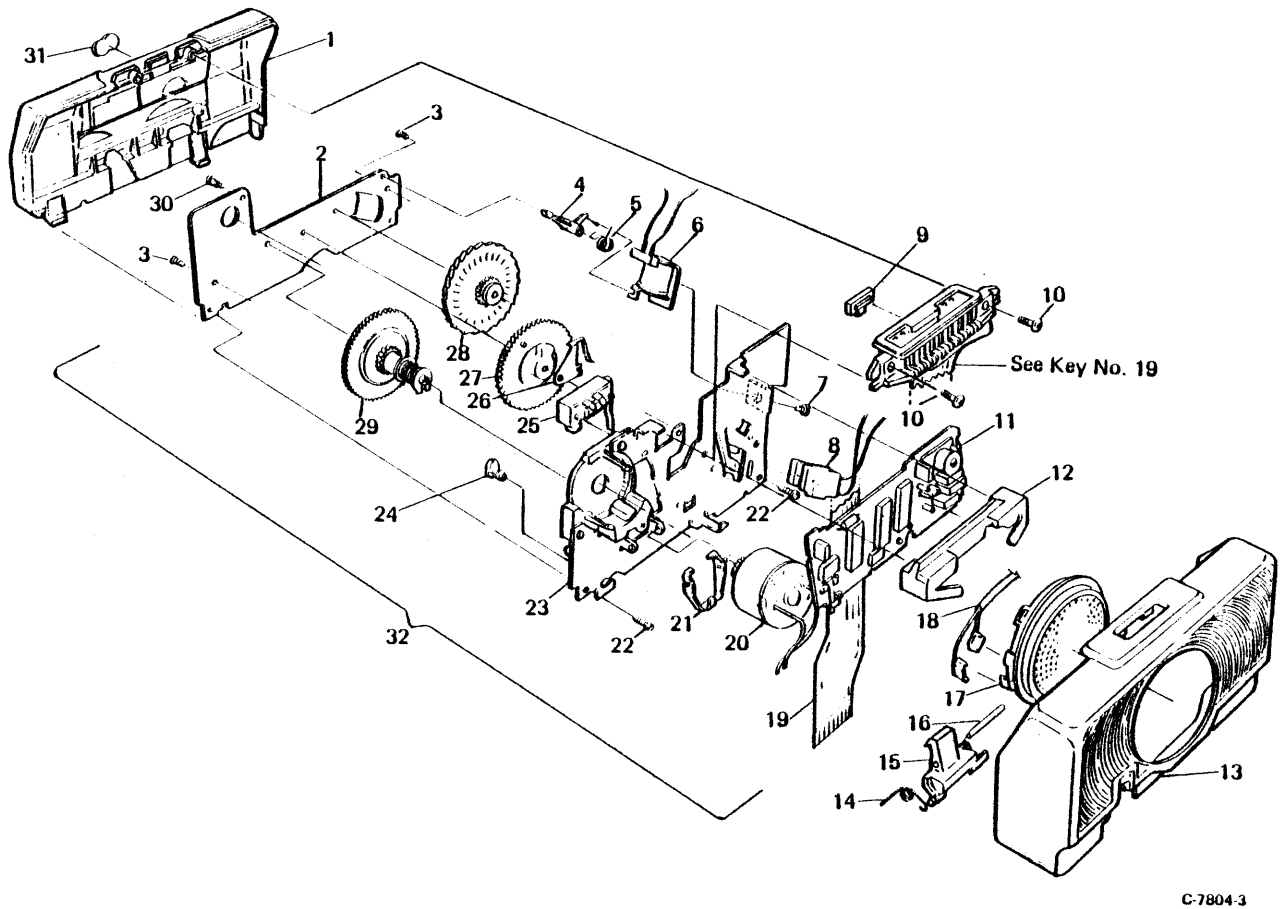
C-7804-2

PARTS LIST 2 – SHUTTER ASSEMBLY

Key No.	Part Name	Part Number* Sonar OneStep	Sonar OneStep SE	Sonar OneStep SE Export	AutoFocus International
1	SHUTTER FRONT HOUSING ASSEMBLY	738378A	738378B	738378B	
2	Retainer Ring	738129A			
3	Reset Link	735847A			
4	Spring, Reset Link	735879A			
5	Trim Decal	706788			
6	Photocell Window	726349B			
7	Photocell Bezel	726081			
8	Lens Bezel	726105			
9	TRIM LINK ASSEMBLY	706268B			
10	Trim Link Retainer	726315			
11	TRIM MOUNTING PLATE ASSEMBLY	726135M			
12	L³I ASSEMBLY	738303A			
13	Photocell Lens	726348			
14	Drive Screw, Self Tapping, Trim Assembly (2)	706666			
14A	Repair Screw, Trim Assembly	700909			
15	First Idler Gear	735570A			
16	Retainer, First Idler Gear	735593A			
17	Idler Gear	726193A			
18	Retainer, Idler Gear	726073			
	LENS AND BLADE ASSEMBLY	Not Stocked			
19	Walking Beam	726357			
20	Shutter Blades, Hybrid (Shipped in matched pairs)	726070			
21	"A" Element Decal Plate	726109			726110 (Metric)
22	Solenoid #1	726111H			
23	Retaining Screw, Focus Wheel	726019			
24	Focus Wheel	735719A			
25	Retainer, Follow Hinge	706697			
26	CAM FOLLOWER ASSEMBLY	726035			
27	Extension Spring, Follow Hinge	706937			
28	SOLENOID #2 PULL DOWN BAR ASSEMBLY	726012			
29	Screw, Solenoid #1	726063			
30	Repair Screw, S1 Housing	700908			
31	S1 MOUNTING BLOCK ASSEMBLY	735665A			
32	Flex Circuit, Shutter Back/Camera Back	706693			
33	Hex Nut, Solenoid #2	706067			
34	Exposure Control Module	735685A			

*Unless otherwise indicated, part number shown for Sonar OneStep applies to all models.

PLATE 3 SONAR MODULE ASSEMBLY



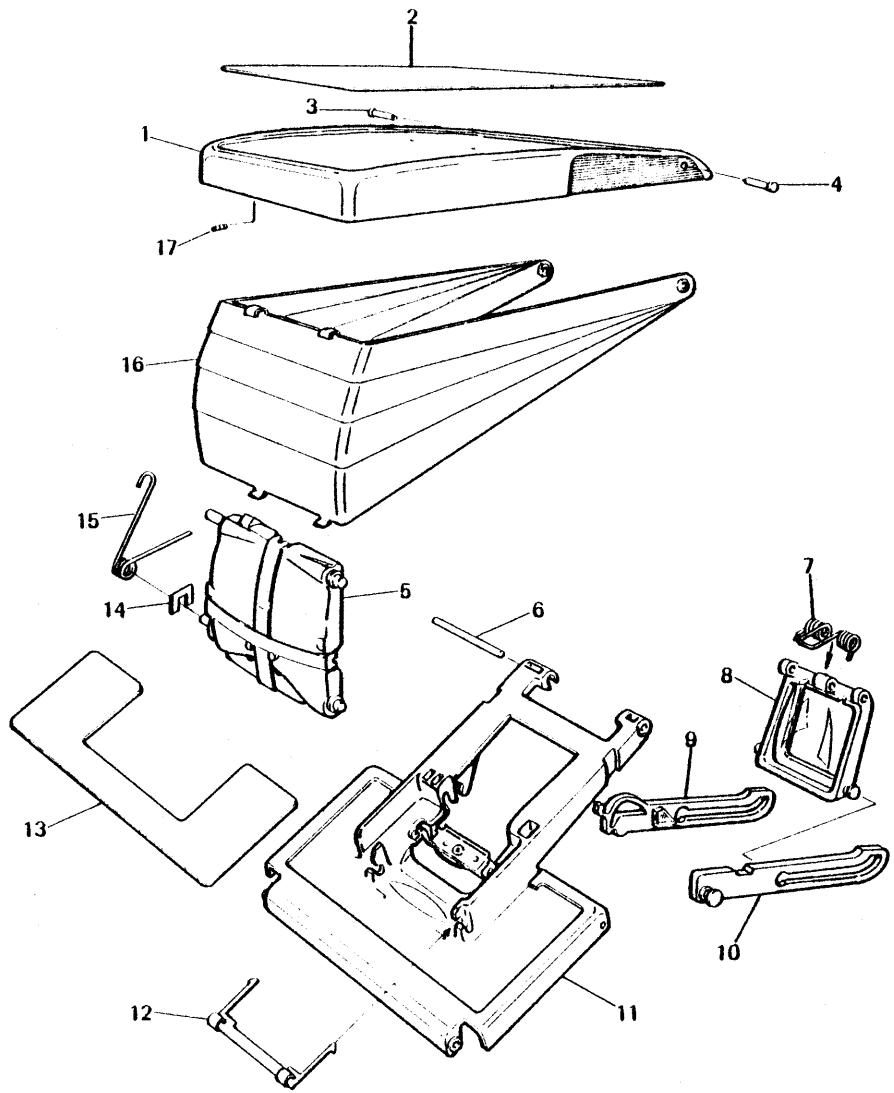
PARTS LIST 3 – SONAR MODULE ASSEMBLY

Key No.	Part Name	Part Number**
1	Back Cover	738042A
2	Rear Plate	735599A
3	Screw, Square Drive, Button-Head (48 x .130) (2)	726411A
4	Pawl	735683A
5	Spring, Pawl-Encoder	735444A
6	CLAPPER, SOLENOID ASSEMBLY	738016A
7	Screw, Solenoid	735894A
8	PICK-OFF ASSEMBLY	735450A
9	Array Retainer (FFA)	738067A
10	Screw, Socket-Head (Flash Socket) (2)	735716A
11	PC BOARD ASSEMBLY* – Yellow	735613A
	– Blue	735613B
	– Green	735613C
12	Bridge	738256A
13	FRONT UPPER HOUSING ASSEMBLY (includes key numbers 14 thru 16)	738379A
14	Spring, Actuator Button Detent	735926A
15	Actuator Button	735486A
16	Actuator Shaft	738197A
17	TRANSDUCER ASSEMBLY* – Yellow	735634A
	– Blue	735634B
	– Green	735634C
18	TRANSDUCER CABLE ASSEMBLY (includes connectors)	735935A
19	FLASH FLEX CIRCUIT ASSEMBLY	738171A
20	MOTOR AND PINION ASSEMBLY	735982A
21	Clutch Platen Fork	735468A
22	Screw, Module/Shutter, Square Drive (2)	735772A
23	FRONT PLATE ASSEMBLY (includes motor housing, park switch, standoffs, shafts)	735628045
24	Adjustment Cam	738168A
25	Park Switch	738576A
26	Stop Spring	738707A
27	Second Idler Gear	735489A
28	Encoder Wheel	735430A
29	CLUTCH ASSEMBLY	735684A
30	Screw, Square Drive, Button-Head (#1-70 x .11) (Self-Tapping)	705956
31	Decal, Back Cover	738889A
32	MODULE AND ELECTRONICS ASSEMBLY – Blue	738374A138
	(includes key numbers 2 thru 11, 18, & 20 thru 30) – Green	738374B138
	– Yellow	738374C138

*The PC Board Assembly and Transducer Assembly must be matched according to color code.

**The part numbers shown here apply to all models.

PLATE 4 SHORT COVER ASSEMBLY

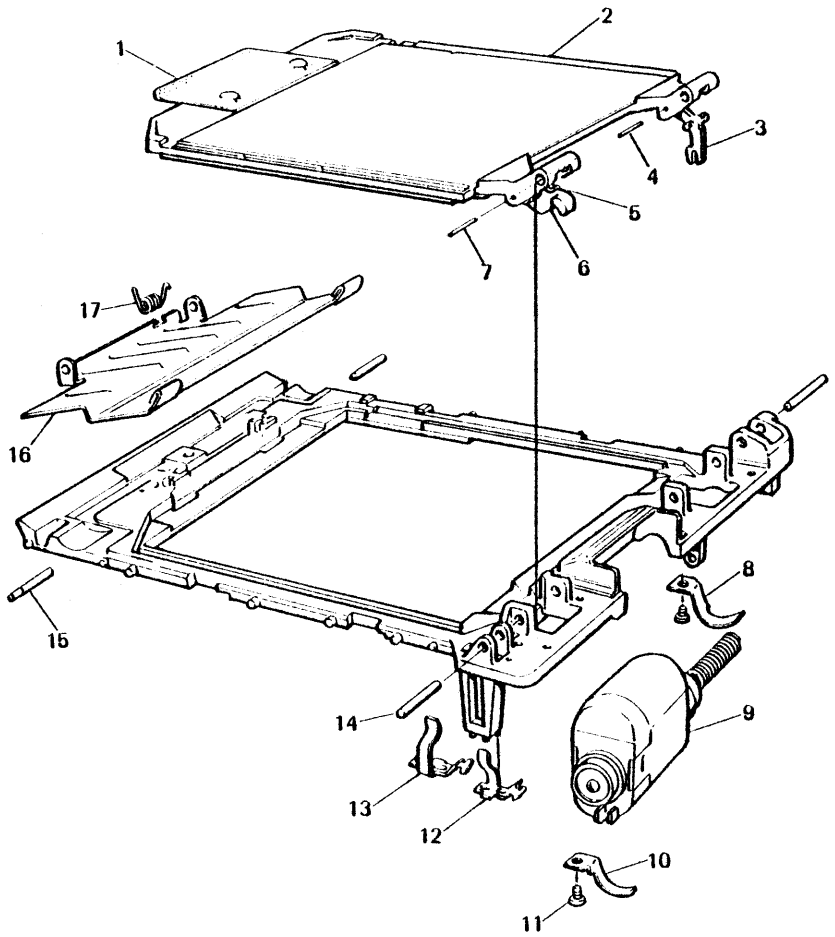


PARTS LIST 4 – SHORT COVER ASSEMBLY

Key No.	Part Name	Part Number*			
		Sonar OneStep	Sonar OneStep SE	Sonar OneStep SE Export	AutoFocus International
1	VIEWFINDER CAP ASSEMBLY	705537B			
2	Leather Insert, Viewfinder Cap	705899B	725143M	725143M	
3	Pin, Viewfinder Cap, Right-Hand	726147			
4	Pin, Viewfinder Cap, Left-Hand	725148			
5	CONCAVE MIRROR ASSEMBLY	725063			
6	Pin, Eyelens Housing	705847			
7	Torsion Spring, Eyelens	705299			
8	EYELENS ASSEMBLY	705610			
9	Eyelens Link, Right-Hand (with prism)	705611B03			
10	Eyelens Link, Left-Hand	705244O			
11	SHORT COVER AND WAFER ASSEMBLY	726062			
12	Positioning Spring	726025			
13	Leather Insert, Short Cover	705187B	725144J	725144J	
14	Shim, Concave Mirror – Red	725057-1			
–	– Yellow	725057-2			
–	– Black	725057-3			
–	– White	725057-4			
15	Spring, Concave Mirror	705281			
16	VIEWFINDER SHADE BLADE ASSEMBLY	705938			
17	Adjusting Screw, Viewfinder Cap	705077			

*Unless otherwise indicated, part number shown for Sonar OneStep applies to all models.

PLATE 5 INNER FRAME & FRESNEL ASSEMBLY



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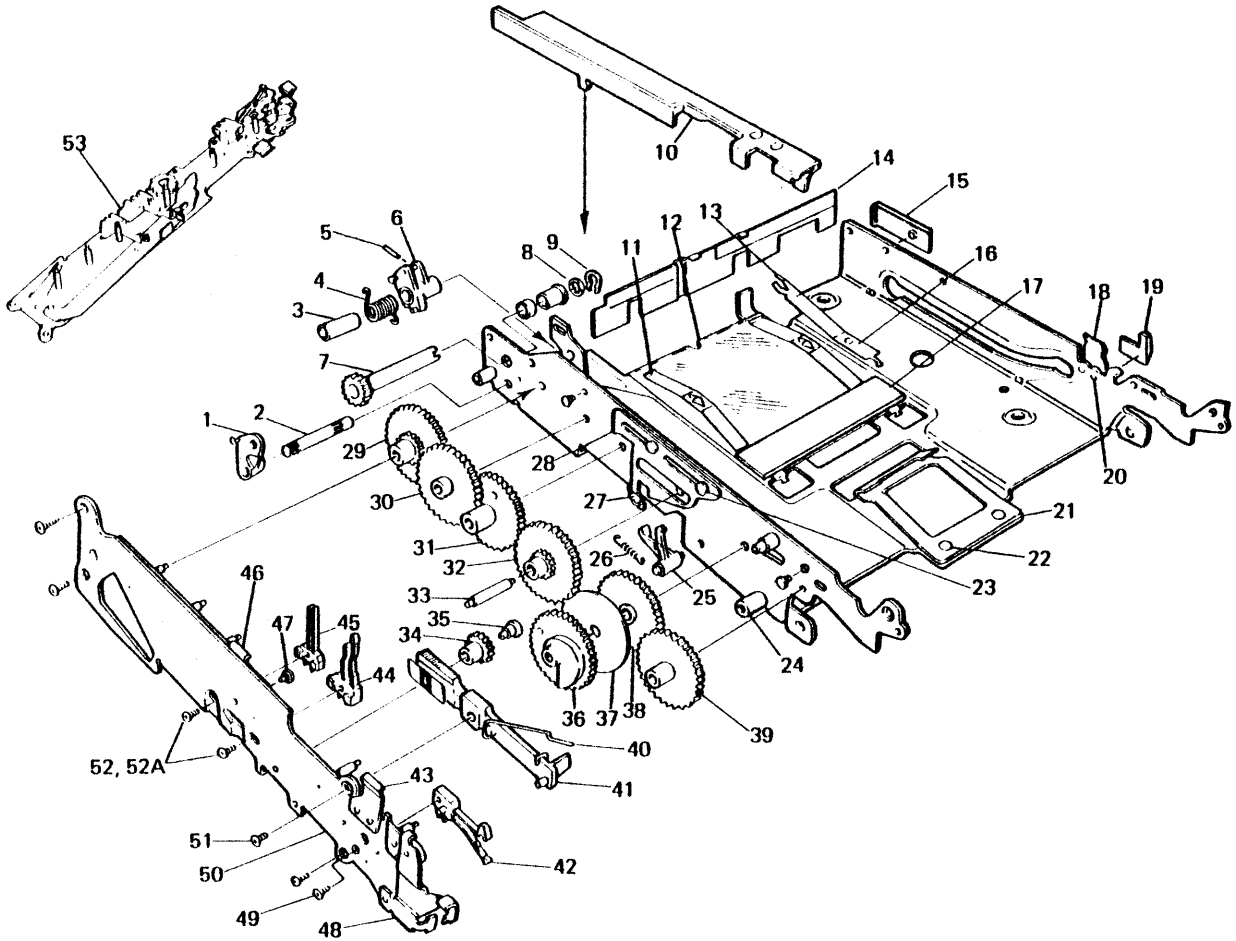
PARTS LIST 6 – INNER FRAME AND FRESNEL ASSEMBLY

Key No.	Part Name	Part Number*
1	Light Stop	705801
2	FRESNEL ASSEMBLY	705458E
3	Drag Link	705897
4	Drag Link Pin	705721
5	Spring, Drive Pawl	705124
6	Drive Pawl	705223
7	Drive Pawl Shaft	705123
8	Motor Clamp, Right	705705
9	MOTOR ASSEMBLY	725285
10	Motor Clamp, Left	705706
11	Screw, Bristol (2)	705169
12	Contact, Safety Switch, Right	705271
13	Contact, Safety Switch, Left	705270
14	Hinge Pin, Fresnel (2)	705134
15	Hinge Pin, Baffle (2)	725097
16	Baffle	725128
17	Spring, Baffle	725090

*Part numbers shown here apply to all models.

PLATE 6 BOTTOM PLATE/OUTER PLATE ASSEMBLY



PARTS LIST 6 – BOTTOM PLATE/OUTER PLATE ASSEMBLY

Key No.	Part Name	Part Number*
1	Bell Crank	–
2	Recock Drive Shaft	–
3	Sleeve	–
4	Drive Spring	–
5	Pivot Pin, Bell Crank	–
6	Drag Link, Bell Crank	–
7	MOTOR PINION SHAFT ASSEMBLY	705713
8	Washer	705036
9	Grip Ring, Motor Shaft	705007
10	Gear Train Cover	705420
11	Battery Contact (2)	705272
12	Contact Insulating Strip	705274
13	Reset Pawl Spring	705224
14	Loading Plate Decal, Motor Clamp	705388
15	Light Seal, Boot Tab	#3485
16	Rivet, Reset Pawl Spring	705003
17	Contact Retainer Block	705273
18	Detent Clip	725178
19	Spacer, Bottom Cover	705566
20	Repair Rivet	705062
21	Front Pack Spring	705249
22	Rivet, Front Pack Spring (2)	705003
23	Pick Slide Pin	705125
24	Lower Standoff	705103
25	Pick Latch	705667
26	Spring, Pick Latch	705668
27	Spring, Pick Return	705106
28	PICK ASSEMBLY	705222
29	First Reduction Gear	705203
30	Second Reduction Gear	705204
31	First Idler Gear	705209
32	Third Reduction Gear	705205
33	Gear Pin	705104
34	Recock Idler Gear	705200
35	Idler Gear Stud	705102
36	RECOCK GEAR ASSEMBLY	705842
37	Washer	705745
38	Second Idler Gear	705634
39	Third Idler Gear	705206
40	Latch Spring	705680
41	LATCH ASSEMBLY	705679
42	S7 ASSEMBLY	705594
43	Detent Clip	725386
44	S3 ASSEMBLY	705317
45	S5 ASSEMBLY	705318
46	Recock Ram	705301
47	Ram Slide, Pin	705722
48	Cable Guide	705682
49	Screw, S7 Mounting	705380
50	Rivet, Outer Plate Detent (2)	705062
51	Screw, Outer Plate/Inner Frame (3)	705044
52	Screw, S3/S5 Bristol Drive (3)	705169
52A	Screw, Square Drive, Button-Head #0-48 x .13 (Self-tapping)	705956
53	OUTER PLATE ASSEMBLY (less gears)	725086

*Part numbers shown here apply to all models.