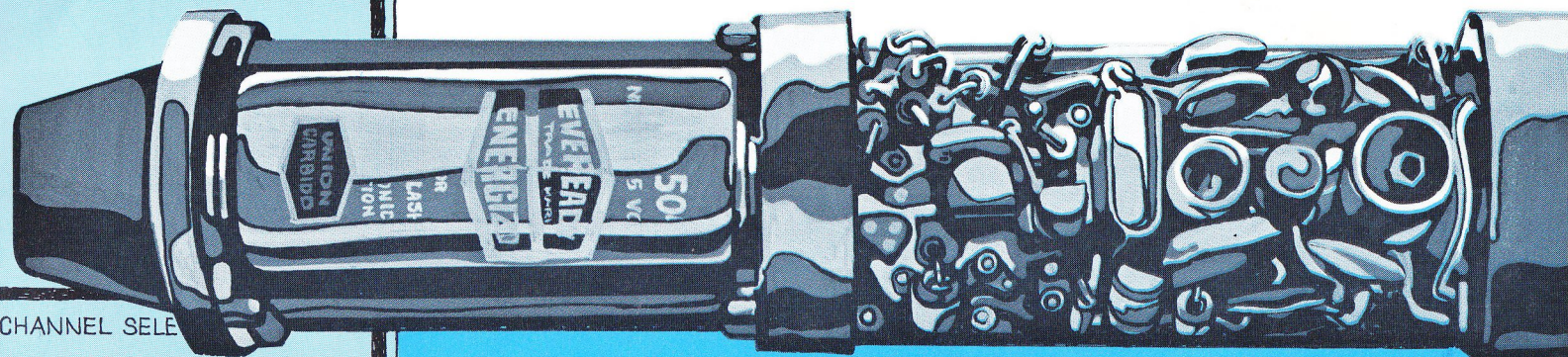


TRANSROC

SPIN RATE™ ACCESSORY MANUAL



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SPIN-RATE TM ACCESSORY KIT

R&D-435-71

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CHAPTER I.

GENERAL

This manual is a supplement to the "TRANSROC Owner's Manual" and cannot be used alone. It is assumed that the purchaser of the spin-rate TM accessory kit will make simultaneous use of this supplement, the "TRANSROC Owner's Manual," and the "Electronic Kit Builder's Handbook" as he converts his TRANSROC to the spin-rate telemetering mode.

CHAPTER II. CONSTRUCTION

SECTION A. Parts List

Quan.	Stock Number	Description	Price*
() 1	TXL-2	Photocell (masked)	3.50 each
() 1	TXF-1	Insulated sleeving, 1 inch length10 each
() 1	TXC-7	.047 mfd capacitor50 each
() 1	TXR-10	1/4 watt resistor, 2.2 meg. (red, red, green, silver) or 2.0 meg. (red, black, green, gold)20 each
() 1	TXR-11	4.7 meg., 1/4 watt resistor (yellow, violet, green, gold)20 each
() 1	TXR-12	9.1 meg., 1/4 watt resistor (gray, brown, green, gold)20 each

*Prices listed are current as of this printing (July, 1971) and are subject to change without notice.

SECTION B.

Attaching Components to the Circuit Board

Read carefully the soldering instructions in the separate "Electronic Kit Builder's Handbook" included with the TRANSROC.

Note that some changes were made in the design of the TRANSROC after the first 1,000 units had been manufactured. The changes which generated the "B" configuration made an improvement in ease of construction and made the PC board less subject to being damaged by excessive soldering heat. These changes also made it unnecessary for a resistor to be selected by the owner when installing his first TM kit. Although the circuit modifications were minor, considerable change to the PC board layout was required in order to accommodate them.

The "A" and "B" configurations are identical in operating characteristics and specifications. Two portions of this manual which relate to construction are duplicated (one for each TRANSROC PC board configuration). You should use only the set of instructions and figures which apply to your TRANSROC configuration.

Note that each component identifier line in Figures 1A and 1B ends at a dot which is located on the body of the respective component. Place a check mark in the () provided as you complete each step. In each case, when the instruction calls for the installation of a component, several additional instructions are implied:

- (a) The component must be installed in the position shown in the respective illustrations on the side of the PC board opposite the copper lands.
- (b) If a two-lead component such as a resistor or diode is to be installed in an upright position, the upper lead must be bent nearly 180 degrees to allow insertion of both leads into the PC board.
- (c) The component must be oriented as shown in Figure 1A or 1B (depending upon which configuration TRANSROC you have). In cases where the illustration is inadequate to identify polarity, etc., the instruction will include the additional information. Be careful to insert transistors with the flat surface oriented as shown in the appropriate illustration.
- (d) Solder all leads of the component to the appropriate lands on the bottom of the PC board. Withdraw the soldering tip by running it up the lead.
- (e) Clip off the excess lead length using a pair of small, side-cutting pliers.

The two alternate sets of assembly steps (A and B) are presented below. Compare your TRANSROC with the figures in the "A" and "B" sections and use only the section which applies. WARNING: Do not use acid core solder. It will ruin your TRANSROC.

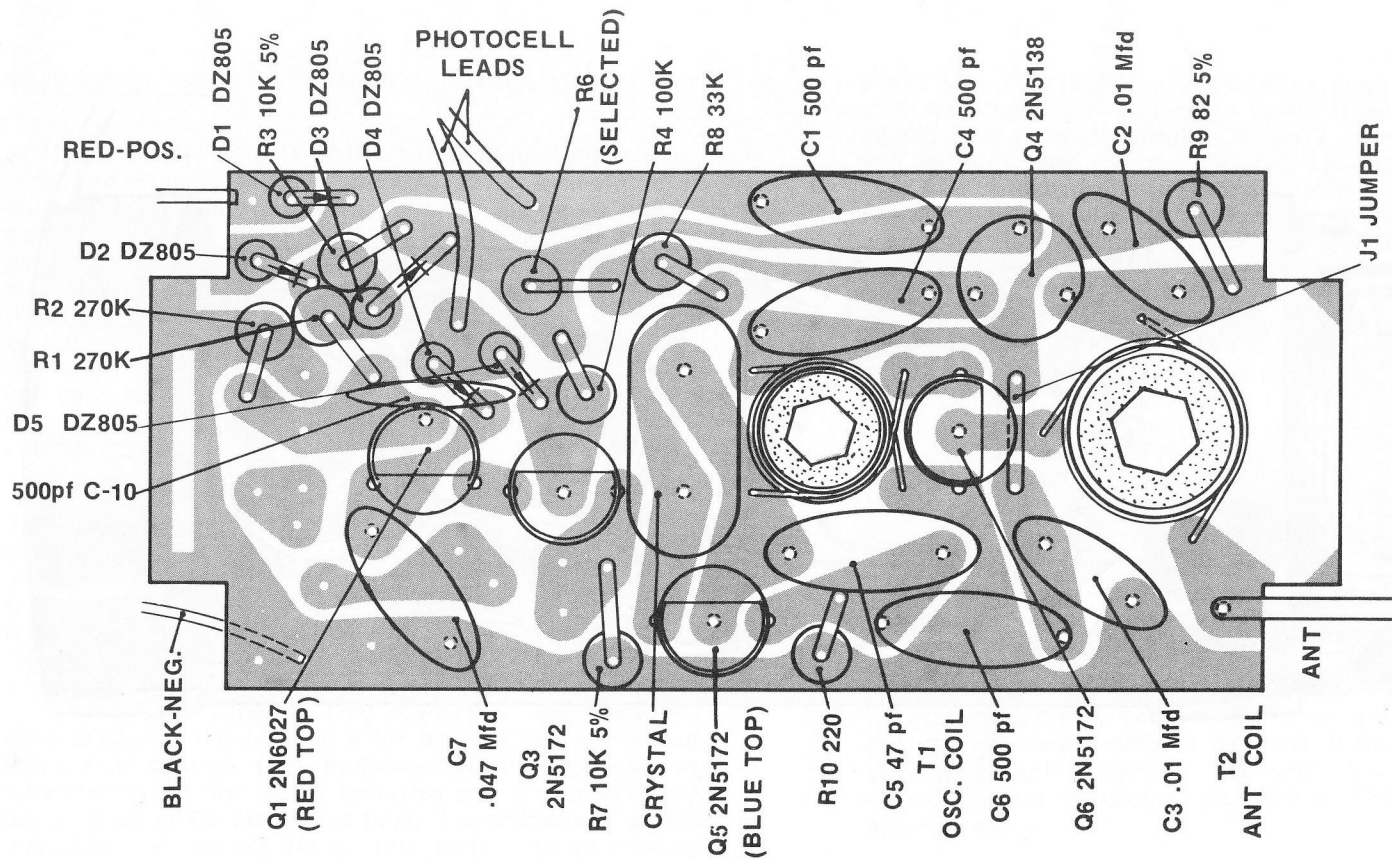


FIG. 1A "A" CONFIG. TRANSROC, SPIN-RATE MODE

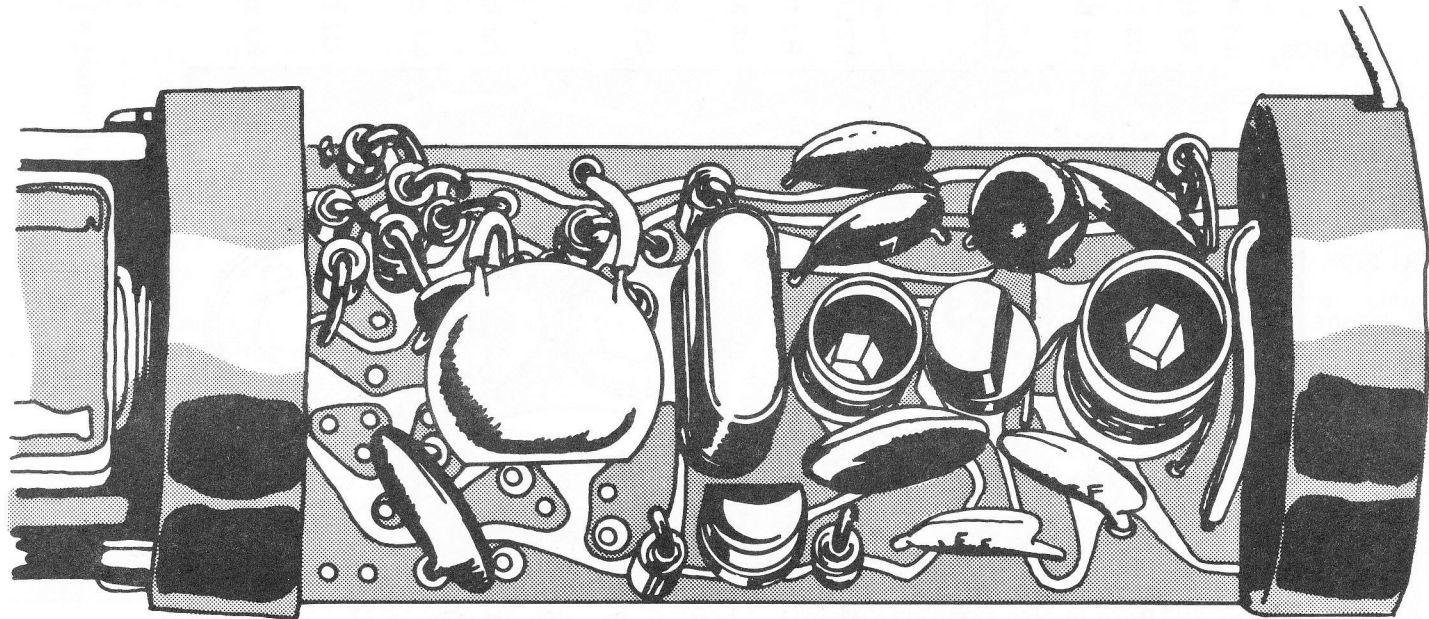


FIG. 2A TOP VIEW, "A" CONFIG. TRANSROC, SPIN-RATE MODE

Modification Steps, (TRANSROC Configuration "A"):

If your TRANSROC is of the "A" configuration, it will look like Figures 1A, 2A, and 3A, and the modification steps will be per the instructions which appear below. You may be able to skip Steps (1A) through (7A) which deal with the selection of the proper value of R6. The objective of these resistor selection steps is to insure that the TRANSROC oscillator will "idle" when powered by the most severely worn battery that could be used in a telemetering mode. Once this resistor selection procedure has been performed, it does not need to be repeated when installing other telemetering kits or returning the TRANSROC to another mode.

Skip Steps (1A) through (7A) if your "A" configuration TRANSROC was assembled at the factory instead of being purchased as a kit and if you have not replaced Q4 or D2. If your factory assembled TRANSROC ("A" configuration) did not have an R6 installed, it means that the results of the tests performed at the factory per Steps (1A) through (4A) indicated that none was needed.

Skip Steps (1A) through (7A) if your "A" configuration TRANSROC was built from a kit but has previously had Steps (1A) through (7A) performed at the time another telemetering kit was being installed and if you have not replaced Q4 or D2 since that time. The absence of an R6 indicates that the results of your tests upon performing Steps (1A) through (4A) showed that none was needed.

- 1A. () Place your TRANSROC (rocket-finder mode) on your workbench and prepare to power it with a source of 9 volts (to simulate a badly worn 15-volt battery). Any source of 9 volts DC can be used, but a cheap and widely available source is a 9-volt transistor battery like those commonly used in walkie-talkies and pocket size radios (ESTES Cat. #FPB-9 or equivalent). If your walkie-talkie uses a 9-volt battery, you could buy a new battery for it and use it first for this resistor selection and later in the walkie-talkie, when your present walkie-talkie battery wears out. You should, in any case, select for this test a 9-volt battery that is known to be in good condition. Do not turn on the TRANSROC yet.
- 2A. () Temporarily solder a jumper wire between points "1" and "3" on the bottom of your TRANSROC PC board. (See Figure 3A.) This tack soldering will be easier if you first tin the tips of the jumper wire.
- 3A. () Place your walkie-talkie (with antenna collapsed) on the bench beside your TRANSROC, and turn its volume control completely up or until it produces an easily audible background hiss. If your walkie-talkie operates on more than one channel, select the channel that your TRANSROC operates on.

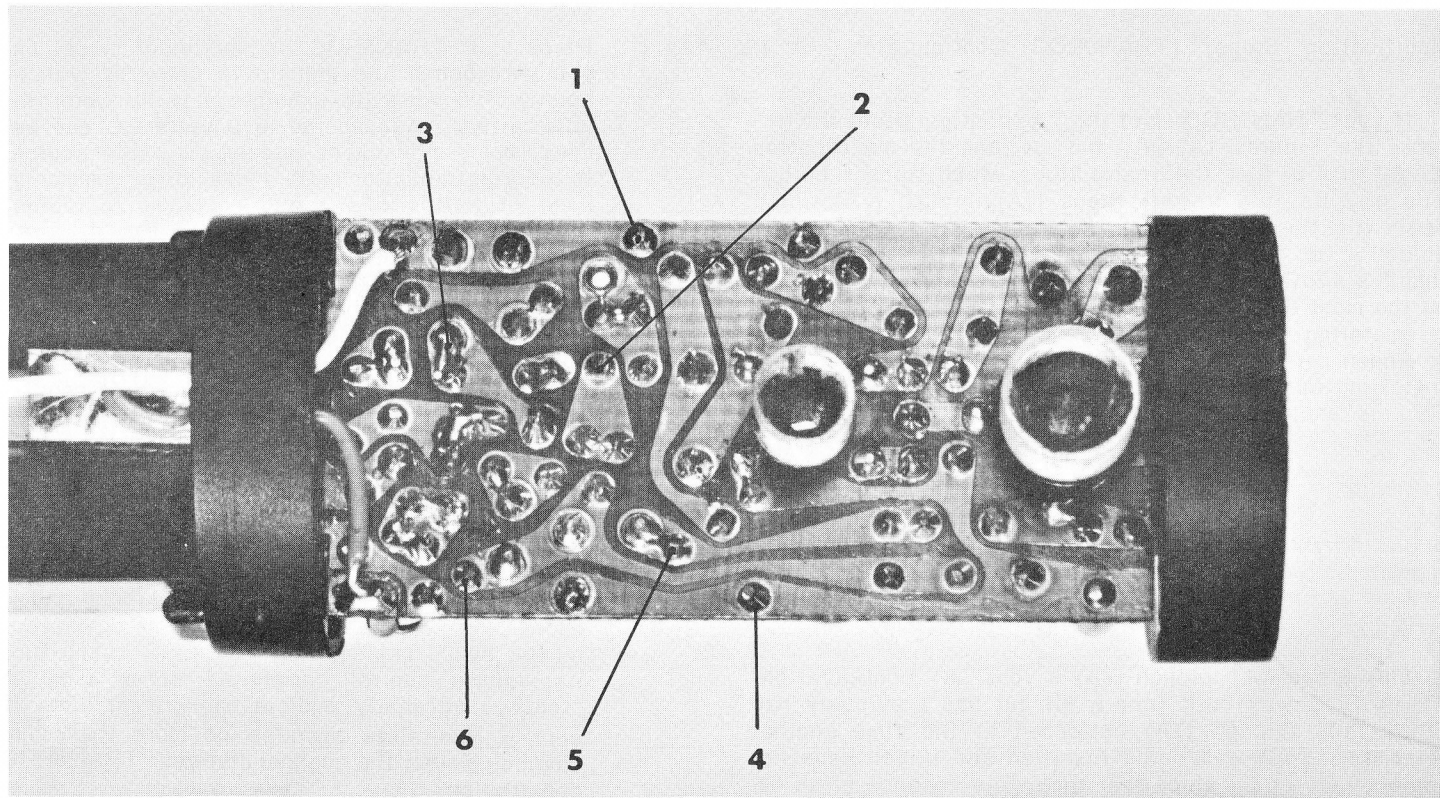


FIG. 3A BOTTOM VIEW "A" CONFIG. TRANSROC, SPIN-RATE MODE

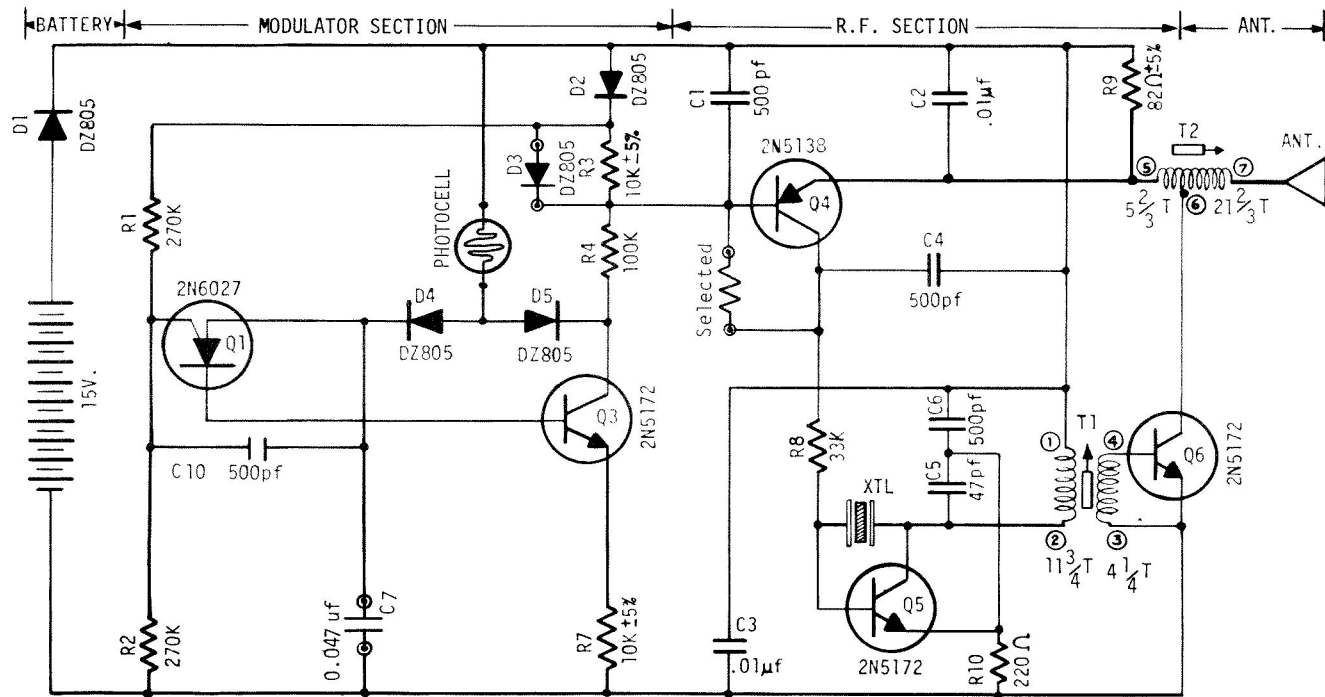


FIG. 4A SCHEMATIC DIAGRAM. "A" CONFIG. TRANSROC, SPIN-RATE MODE

- 4A. () Turn on the TRANSROC by connecting your external 9-volt power source. If a hiss appears in your walkie-talkie when you turn on the TRANSROC, no R6 is required; and you may skip Steps (5A) through (7A).
- 5A. () If you detected no increase in the level of hiss coming from your walkie-talkie when you turned on the TRANSROC in Step (4A), you will need to install a selected value of R6. Bend the leads of the 9.1 meg. resistor (gray, brown, green, gold) at each end of the resistor body to form approximately a "U" shape. (Don't use sharp bends in the leads, since this is temporary.) Temporarily solder this resistor between points "5" and "6" on your PC board. (See Figure 3A.) Again, turn on the TRANSROC by connecting the temporary 9-volt power source. If an increase in hiss level is detected on your walkie-talkie when the TRANSROC is turned on, whereas none was detected without an R6, install the 9.1 meg. resistor permanently as R6. (See Figures 1A and 2A.) Be sure to solder both brass eyelets securely to the copper lands.
- 6A. () If no idle hiss was detected in Step 4A (no R6) or Step 5A (R6 = 9.1 meg.), repeat Step 5A using the 4.7 meg. resistor (yellow, violet, green, gold).
- 7A. () If no idle hiss was detected in Step 4A (no R6), Step 5A (R6 = 9.1 meg.), Step 6A (R6 = 4.7 meg.), repeat Step 5A using a 2.2 meg. (red, red, green, silver) or 2.0 meg. (red, black, green, gold) resistor (whichever was supplied with your accessory kit).
- 8A. () If you install an R6 in any of these steps, be sure to solder the miniature eyelets securely to their respective copper lands. Any unused resistors which were supplied with the spin-rate TM accessory kit should be added to your "junk" box of electronic parts. Remove jumper added in step 2A.
- 9A. () Desolder and remove C7 (a 3.3 mfd tantalum capacitor used in the rocket-finder mode). (See Figure 1 in the "TRANSROC Owner's Manual.")
- 10A. () Install C7 (a 0.047 mfd capacitor used in the spin-rate TM mode). (See Figure 1A and 2A.) This capacitor is not polarized.
- 11A. () Desolder and remove R5 (270K resistor - red, violet, yellow, silver). (See Figure 1 in the "TRANSROC Owner's Manual.")
- 12A. () Connect the leads of the photocell to the eyelet terminals from which R5 was just removed. Use the insulated sleeving on the photocell leads. Install the photocell as shown in Figure 2A

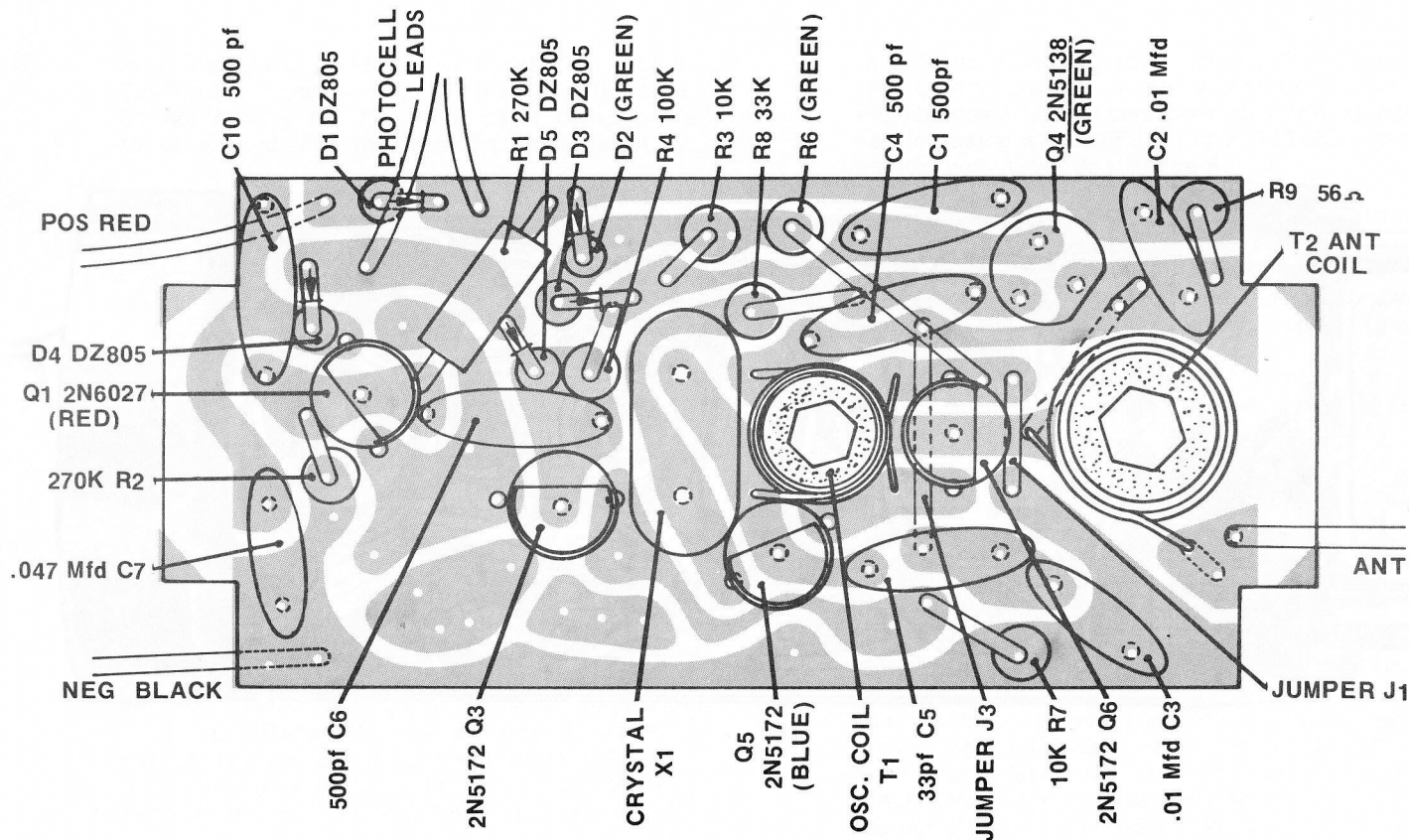


FIG. 1B "B" CONFIG. TRANSROC, SPIN-RATE MODE

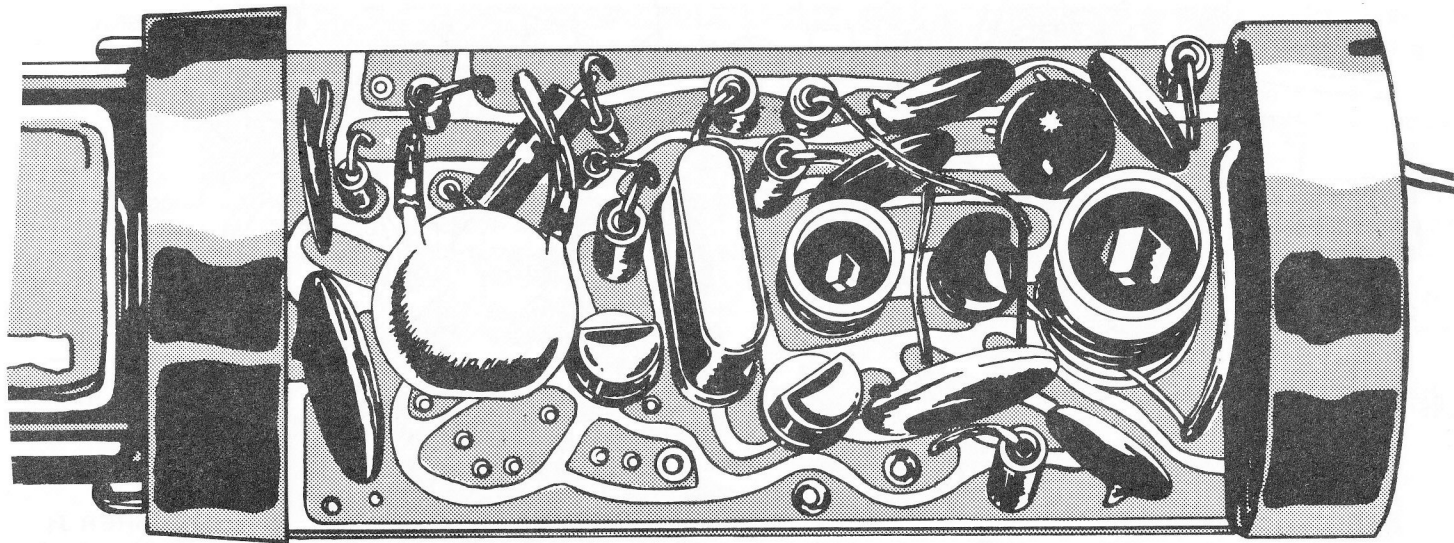


FIG. 2B TOP VIEW, "B" CONFIG. TRANSROC, SPIN-RATE MODE

with the black side toward the PC board. CAUTION! Handle the photocell with care. Do not disturb the two-color paint coating. To do so will change the masking characteristics.

- 13A. () Inspect the completed assembly to verify that it looks like Figure 2A. If Q2, C9, R11 and R12 have previously been added for use of the microphone accessory, they do not need to be removed.
- 14A. () Inspect the bottom of the PC board for poor solder joints, solder bridges, etc. It should look like Figure 3A.
- 15A. () Clean the bottom of the PC board with a suitable solvent. See your "TRANSROC Owner's Manual."
- 16A. () Turn on the TRANSROC by inserting the battery, and illuminate the sensitive side of the photocell with a very bright artificial light or the sun. You should receive an audio tone on your receiver. The frequency of the tone should increase for bright illumination and should decrease and/or disappear for low illumination.
If your TRANSROC does not pass these tests, remove the battery (to prevent damage in case of a short) and refer to the troubleshooting section in your "TRANSROC Owner's Manual."
- 17A () Install the completed and checked-out assembly

in a transparent payload section. Transparency is required in order to allow sunlight to strike the photocell transducer. Construct this payload section using a PS-50FJ kit or a PST-50FJ clear plastic body tube. See Figure 5.

Modification Steps, (TRANSROC Configuration "B"):

If your TRANSROC is of the "B" configuration, it will look like Figures 1B, 2B, and 3B, and the modification steps will be per the instructions which appear below:

- 1B. () Desolder and remove C7 (a 3.3 mfd tantalum capacitor used in the rocket-finder mode). (See Figure 1 in the "TRANSROC Owner's Manual.")
- 2B. () Install C7 (a .047 mfd capacitor used in the spin-rate TM mode). (See Figure 1B.)
- 3B. () Desolder and remove R5 (a 270K resistor - red, violet, yellow, silver). (See Figure 1 in the "TRANSROC Owner's Manual.")
- 4B. () Connect the leads of the photocell to the eyelet terminals from which R5 was just removed. Use the insulated sleeving on the photocell leads. Install the photocell as shown in Figure 2B with the black side toward the PC board. CAUTION! Handle the photocell with care. Do not disturb the two-color paint coating. To do so would change the masking characteristics.

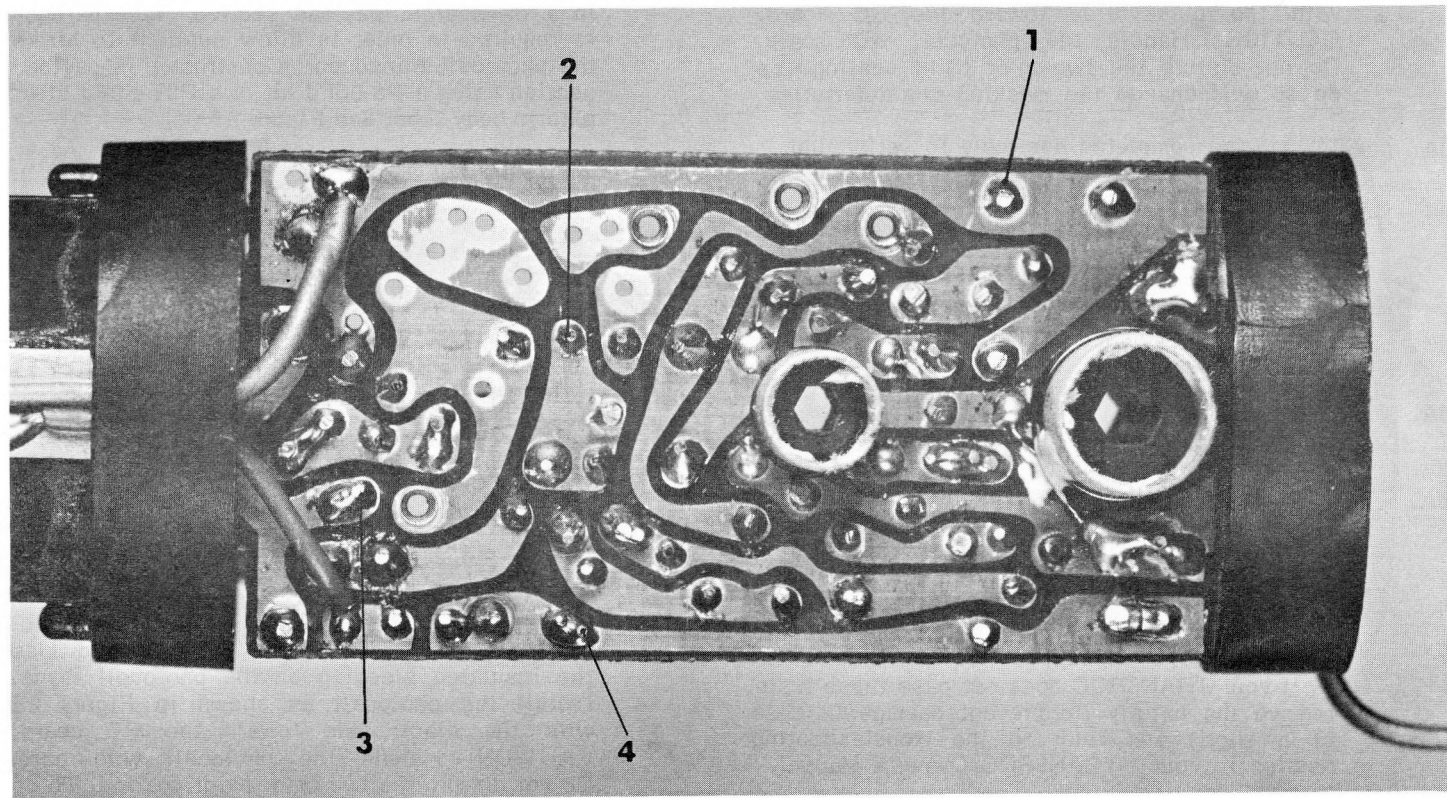


FIG. 3B BOTTOM VIEW "B" CONFIG. TRANSROC, SPIN-RATE MODE

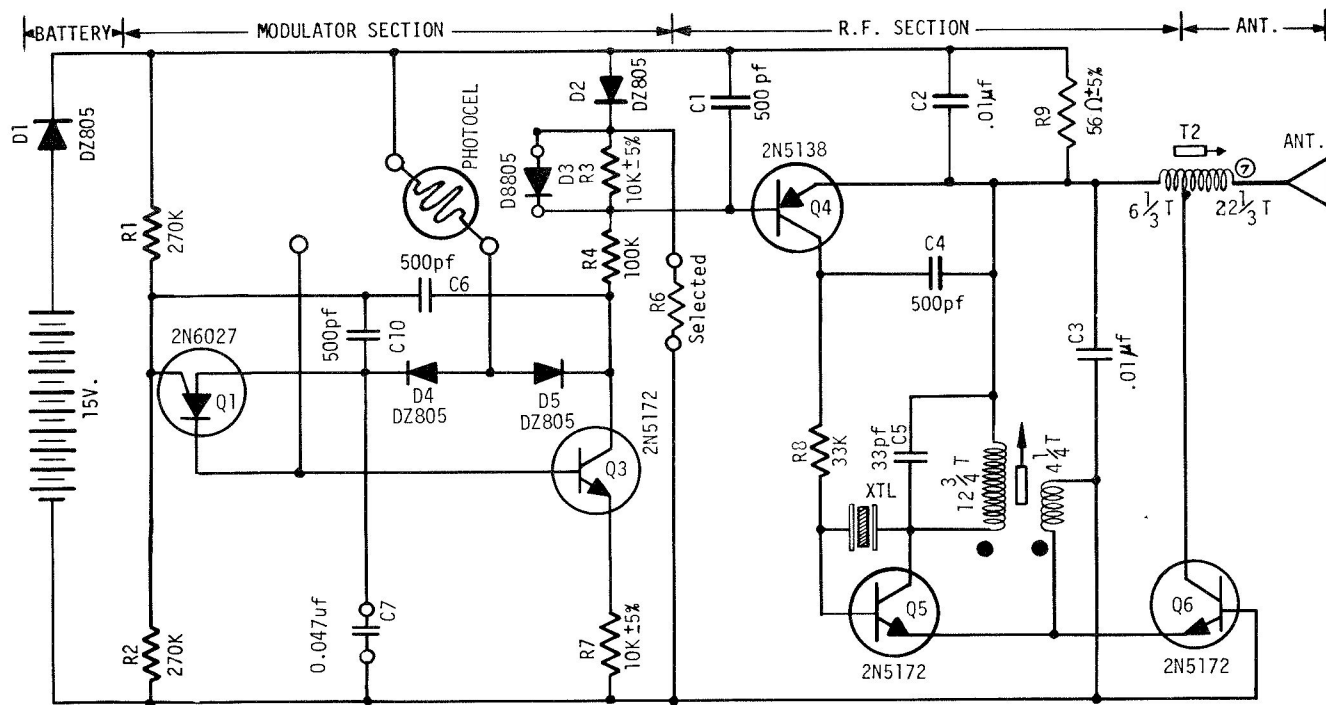


FIG. 4B SCHEMATIC DIAGRAM "B" CONFIG. TRANSROC, SPIN-RATE MODE

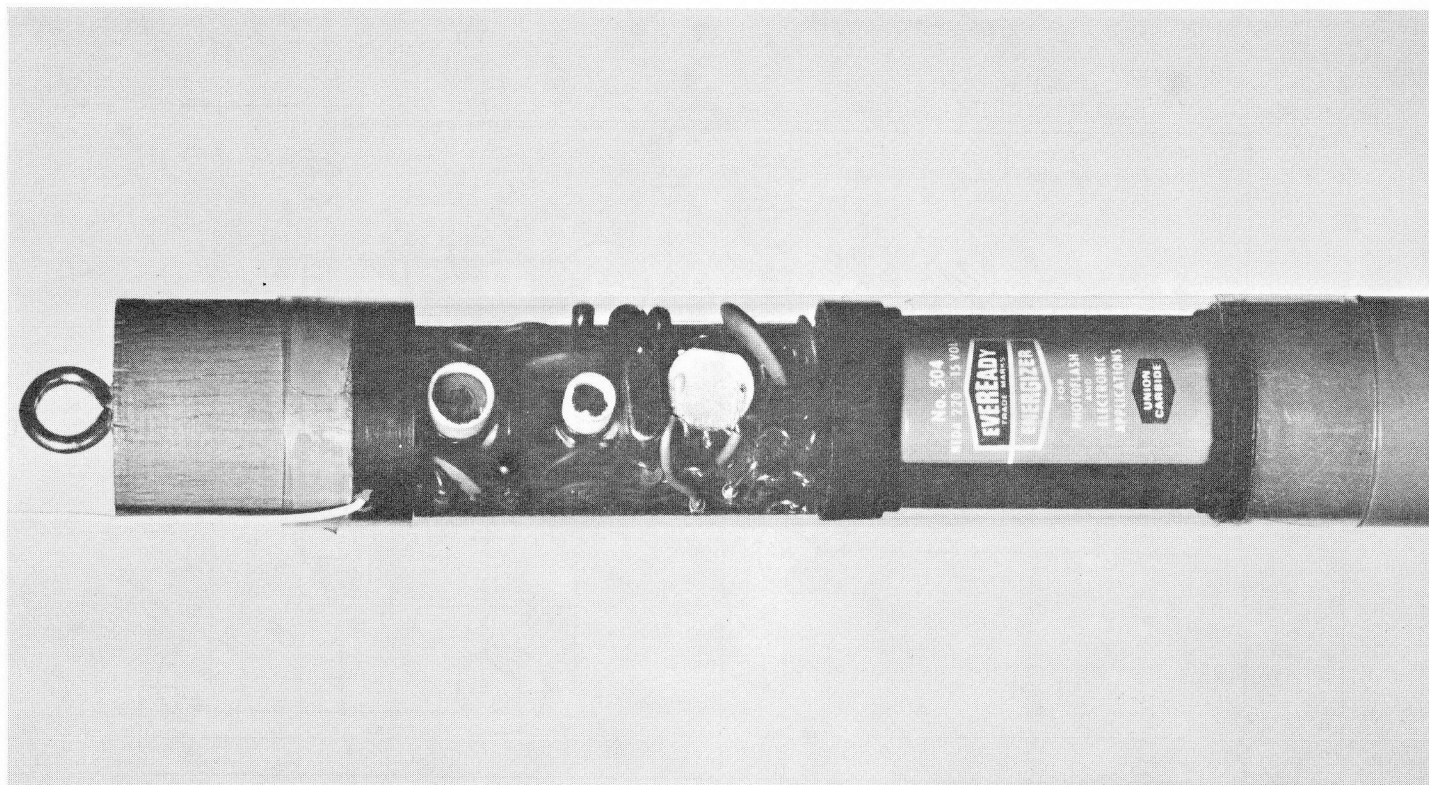


FIG. 5 TRANSROC IN CLEAR PLASTIC PAYLOAD SECTION

- 5B. () Inspect the completed assembly to verify that it looks like Figure 2B. If Q2, C9, C11, R11, and R12 have previously been added for use of the microphone accessory, they do not need to be removed. (See Figure 23 in the "TRANSROC Owner's Manual.")
- 6B. () Inspect the bottom of the PC board for poor solder joints, solder bridges, etc. It should look like Figure 3B.
- 7B. () Clean the bottom of the PC board with a suitable solvent. See your "TRANSROC Owner's Manual."
- 8B. () Turn on the TRANSROC by inserting the battery, and illuminate the sensitive side of the photocell with a very bright, artificial light or the sun. You should receive an audio tone on your receiver. The frequency of the tone should increase for bright illumination and should decrease and/or disappear for low illumination.
- If your TRANSROC does not pass these tests, refer to the troubleshooting section in your "TRANSROC Owner's Manual."
- 9B. () Install the completed and checked-out assembly in a transparent payload section. Transparency is required in order to allow sunlight to strike the photocell transducer. Construct the payload section using a PS-50FJ kit or a PST-50FJ clear plastic body tube. See Figure 5.

CHAPTER III.

TUNING

The tuning procedure for the telemetering modes is the same as that for the rocket-finder mode. If retuning appears to be required, consult the procedure for final tuning in the "TRANSROC Owner's Manual."

CHAPTER IV.

TROUBLESHOOTING

If your TRANSROC does not operate properly after you convert it to the spin-rate TM mode, refer to the troubleshooting section of your "TRANSROC Owner's Manual." If you send your TRANSROC for factory service in the spin-rate TM mode, be sure to include the photocell assembly (carefully packed).

CHAPTER V.

OPERATION

The objective for spin-rate telemetering flights is to examine spin-rate versus flight time. The use of a suitably masked photocell type transducer allows you to do this since, as the rocket spins, greater and lesser amounts of sunlight will alternately strike the transducer. This causes the TRANSROC to transmit a changing tone with a pitch approximately proportional to light intensity. Several methods of data reduction are possible.

SECTION A. Listening During Flight

The least expensive method of data reduction consists of merely listening to the receiver during rocket flight. With this technique, you can easily tell which rockets spin rapidly and which rockets spin slowly.

SECTION B. Tape Recording

A greater degree of data reduction accuracy is achieved by tape recording the output of the receiver and playing it back repeatedly. The repetition allows you to digest much better the finer points of what happened during a few moments of action and excitement. See the "TRANSROC Owner's Manual" for instructions on how to tape record the output of your receiver.

SECTION C. Full Data Reduction

By either of two methods, you may use an analog recorder to achieve full data reduction. See Chapter V in the "TRANSROC Owner's Manual" for details of how to connect a tape recorder or an analog recorder to the output of your walkie-talkie.

- C1. Tape record the signal from your TRANSROC at a relatively high tape speed, such as 7 1/2 inches per second. Play this data back into an analog recorder at a slow tape speed, such as 1 7/8 inches per second. Run the analog recorder at a relatively high speed (over 100 mm/sec.). This four-to-one division of the spin-rate modulation frequency will bring it within the frequency response capability of most analog recorders.

The data reduction procedure is then completed by locating the times, with respect to launch, where maximum and minimum frequencies are evident on

the recording. Maximum frequencies occur when the photocell side of the rocket is toward the sun, and minimum frequencies occur when the photocell is away from the sun.

- C2. Replace C7 with a larger capacitor (perhaps 0.22 mfd). This will reduce the modulation frequency and bring it within the frequency response of most analog recorders, without loss of data resolution (except for unusually high spin rates). You can then record directly on the analog recorder during flight, or you can use the tape recorder as an intermediate step with the same tape speed being used for both record and playback. Final data reduction is the same as for method one above.

CHAPTER VI.

RETURNING TO THE ROCKET-FINDER MODE

Once you have finished using your TRANSROC in the spin-rate TM mode, you may want to change it back to the rocket-finder mode. Two alternate sets of modification steps (A and B) are presented below. Compare your TRANSROC with the figures in the "A" and "B" sections and use only the section which applies.

Modification Steps, (TRANSROC Configuration "A"):

If your TRANSROC is of the "A" configuration, it will look like Figures 1A, 2A, and 3A, and the modification steps will be per the instructions which appear below:

- 1A. () Desolder and disconnect the photocell leads from the PC board. (See Figure 1A.)

- 2A. () Install R5 (a 270K resistor - red, violet, yellow, silver). (See Figure 1 in your "TRANSROC Owner's Manual.")
- 3A. () Desolder and remove C7 (a 0.047 mfd capacitor). (See Figure 1A.)
- 4A. () Install C7 (a 3.3 mfd tantalum capacitor). Be sure to observe polarity per Figures 1 and 2 in the "TRANSROC Owner's Manual." The positive lead mounts "up" (away from the PC board).
- 5A. () Inspect the assembly to verify that it looks like Figure 2 in the "TRANSROC Owner's Manual." If Q2, C9, R11, and R12 have previously been added for use of the microphone accessory, the assembly should look like Figure 23 in the "TRANSROC Owner's Manual."
- 6A. () Inspect the bottom of the PC board to verify that all the solder joints are smoothly soldered and that there are no solder bridges between adjacent copper lands.
- 7A. () Clean the bottom of the PC board with a solvent and brush.
- 8A. () Insert the battery and check operation.
- 9A. () Install in your rocket, and check and/or retune the antenna-matching coil per the instructions

in the "TRANSROC Owner's Manual."

Note that R6 is not removed when returning to the use of other modes.

Modification Steps, (TRANSROC Configuration "B"):

If your TRANSROC is of the "B" configuration, it will look like Figures 1B, 2B, and 3B, and the modification steps will be per the instructions which appear below:

- 1B. () Desolder and disconnect the photocell leads from the PC board. (See Figure 1B.)
- 2B. () Install R5 (a 270K resistor - red, violet yellow, silver). (See Figure 1 in your "TRANSROC Owner's Manual.")
- 3B. () Desolder and remove C7 (a 0.047 mfd capacitor). (See Figure 1B.)
- 4B. () Install C7 (a 3.3 mfd tantalum capacitor). Be sure to observe polarity per Figures 1 and 2 in the "TRANSROC Owner's Manual." The positive lead mounts "up" (away from the PC board).
- 5B. () Inspect the assembly to verify that it looks like Figure 2 in the "TRANSROC Owner's Manual." If Q2, C9, C11, R11, and R12 have previously been added for use of the microphone accessory, the assembly should look like Figure 23 in the "TRANSROC Owner's Manual" instead.

- 6B. () Inspect the bottom of the PC board to verify that all the solder joints are smoothly soldered and that there are no solder bridges between adjacent copper lands.
- 7B. () Clean the bottom of the PC board with a solvent and brush.
- 8B. () Insert the battery and check operation.
- 9B. () Install in your rocket and check and/or retune the antenna-matching coil per the instructions in the "TRANSROC Owner's Manual."



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