



3. Reconnect the cell to the battery pack and charge the batteries for another 14 hours.

If you have purchased a Heathkit Model GDA-405-2

Receiver or Models GDA-405-4 or GDA-505-4 Servos, proceed to the assembly manuals and complete the assembly of those kits while the Transmitter and Receiver batteries are charging.

TEST AND ADJUSTMENTS

NOTE: It is important that all of the adjustments be completed before you put your Transmitter into operation.

The meter furnished with the Transmitter is used as a test meter in this section of the Manual.

If you do not obtain the proper readings in the following steps, turn off the Transmitter and refer to the chart following the step. These charts list possible causes for the malfunction. Also refer to the "In Case of Difficulty" section on Page 52. Correct the problem before proceeding with the next step.

WARNING: The transmitter rf circuit board has been prealigned and pretested. Under no condition should any adjustments on this circuit be changed. To do so will void the warranty of the unit, and will also cause decreased overall performance.

- () Disconnect the charging cable from the ac line, Transmitter, and Receiver Battery if it is still connected.

Refer to Figure 1-2 for the following steps.

NOTE: At this time the thumb knob screws will be tightened. Tighten each screw only enough so the thumb knob will turn the control shaft. As you make the following adjustments on the Transmitter, the thumb knobs will be repositioned on the control shafts.

- () Center the thumb knobs in the nylon guides for all the thumb knob controls (except channel #5) and tighten the thumb knob screws. It may be necessary to remove the rf circuit board.

- () Position the channel #5 thumb knob tab toward the front of the Transmitter. Then tighten the thumb knob screw.

- () Set all Trim controls and Auxiliary channel controls to their center position.

- () Set the channel #5 switch so that the thumb knob tab is toward the front of the Transmitter.

NOTE: Be sure you do not change the settings of the Auxiliary controls, Stick controls, or the Trim controls unless you are instructed to do so.

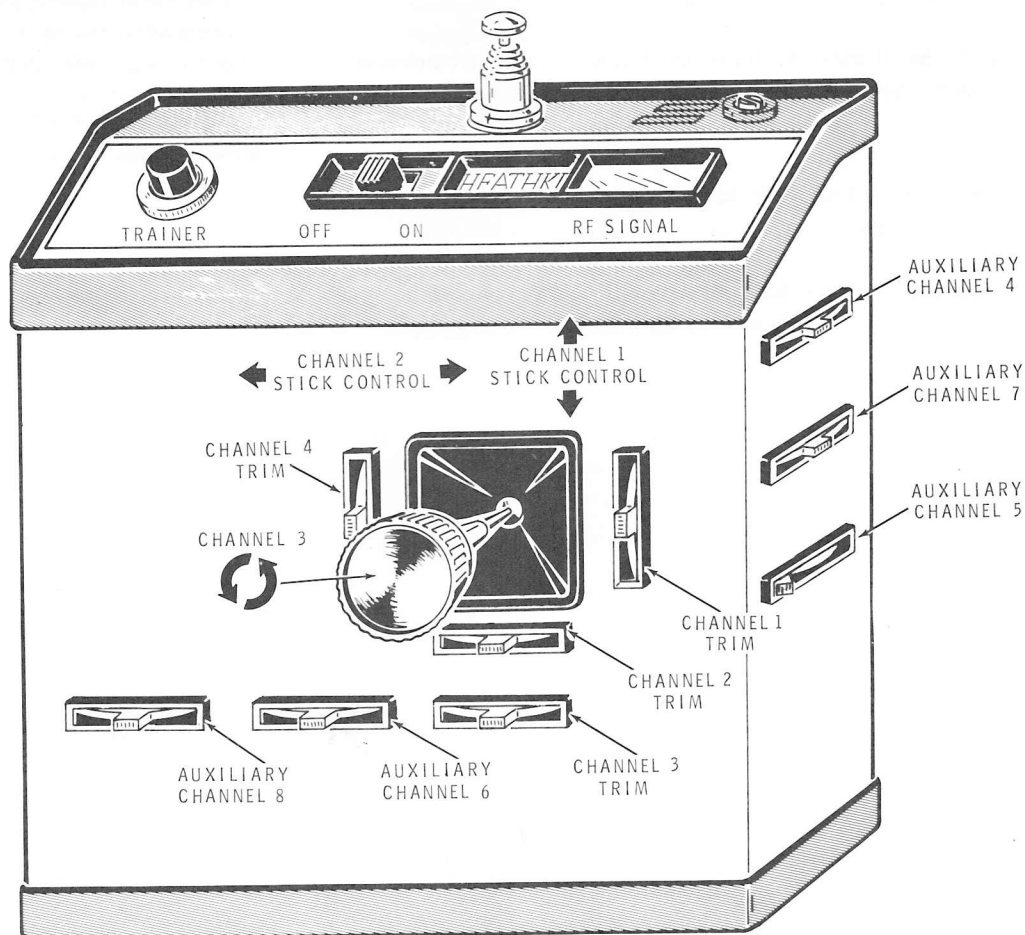


Figure 1-2

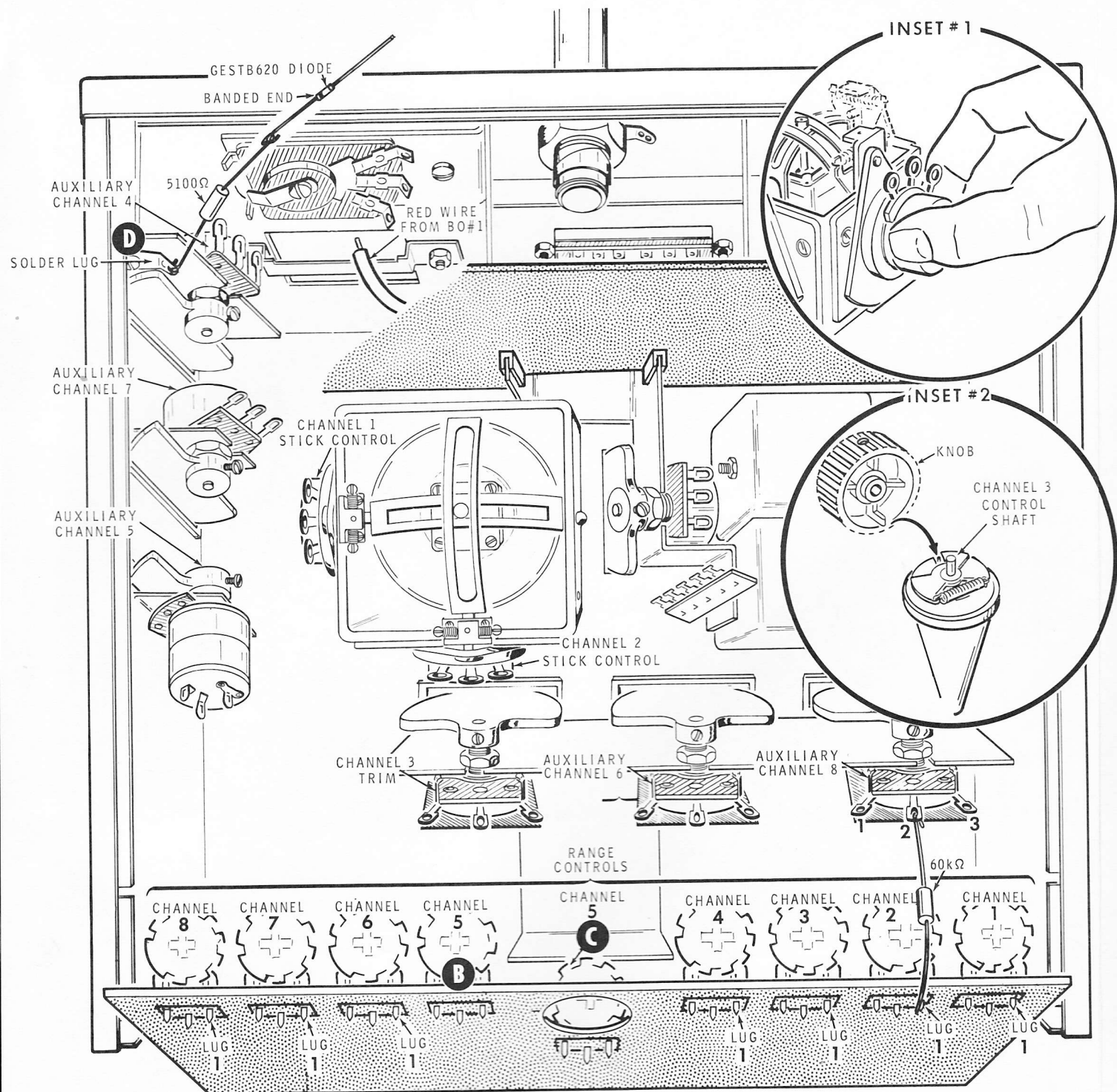


Figure 1-3

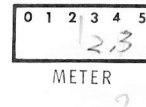
Refer to Figure 1-3 (on the fold-out from this page) for the following adjustments.

- () Connect the black meter lead to solder lug D.
- () Connect the red meter lead to the red wire coming from BO#1 on the harness.
- () Turn the Transmitter On. The meter should read between 1 and 5. If the meter reads 0, refer to the following chart. If the meter reads properly, continue with the next step.

TROUBLE	POSSIBLE CAUSE
Meter reads 0.	<ol style="list-style-type: none"> 1. Transistor Q6 incorrectly installed or shorted. 2. Trainer switch wired incorrectly. 3. Battery incorrectly wired. 4. RF circuit board defective.

- () Turn the Transmitter Off and disconnect the meter.
- () Set channel #5 Range control C full clockwise.
- () Set channel #5 Range control B full counterclockwise.

- () Set all of the other Range controls on the encoder circuit board to their center position.
- () Temporarily solder a 60 kΩ precision resistor from lug 2 of the channel #8 Auxiliary control to lug 1 of the channel #2 Range control.
- () Temporarily solder a 5100 Ω (green-brown-red) resistor to solder lug D.
- () Connect the lead of the banded end of a GESTB620 diode (#56-61) to the free lead of the 5100 Ω resistor. Solder the connection.
- () Connect the black meter lead to the free end of the GESTB620 diode.
- () Connect the red meter lead to lug 1 of the channel #2 Range control (this is the same lug the resistor lead is on).



- () Turn the Transmitter On.
- () Mark the meter reading on the meter face at the right. This meter reading should be between 0 and 5. If it is, proceed to the next step. If the meter reading is "0," or full scale, refer to the following trouble chart.

②



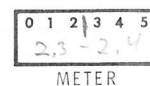
TROUBLE	POSSIBLE CAUSE
Meter reads 0 or full scale.	<ol style="list-style-type: none"> 1. IC-1 incorrectly installed or shorted. 2. IC pins not properly soldered. 3. Transistors Q1, Q2, Q3, or Q4 interchanged or incorrectly installed. 4. Diode D1 or D2 incorrectly installed. 5. Intermittent Range or channel control.
Meter fluctuates.	<ol style="list-style-type: none"> 1. Channel 4, 6, 7, and 8 controls are not correctly centered. Recheck the approximate center of these controls.

NOTE: In the following steps, do not lay the Transmitter down in such a way that the Stick control can be accidentally moved. This will cause a misadjustment.

- () Connect the red meter lead to lug 1 of the channel #1 Range control. Then grasp the body of the channel #1 Stick control in your fingers (or a pair of pliers) and turn the control body until the meter reads the same as in the previous step. (Refer to the inset drawing #1 on Figure 1-3.)

TROUBLE	POSSIBLE CAUSE
Unable to obtain the correct meter reading.	<ol style="list-style-type: none"> 1. Channel #1 Stick control, R18, is incorrectly wired. 2. Diode D4 is incorrectly installed or shorted. 3. Channel #1 Range control, R29, is the wrong value.
Meter fluctuates	<ol style="list-style-type: none"> 1. Channel 4, 6, 7, and 8 controls are not correctly centered. Recheck the approximate center of these controls.

- () Connect the red meter lead to lug 1 of the channel #2 Range control. Mark this meter reading on the meter face at the right. This will be the reference for the next adjustment.

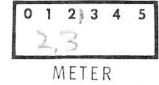


METER

- () Connect the red meter lead to lug 1 of the channel #3 Range control.
- () Refer to inset drawing #2 on Figure 1-3 and remove the control stick knob.
- () Turn the channel #3 control shaft until the meter reads the same as the reference meter reading.
- () Carefully replace the control stick knob. Be careful that you do not move the control shaft.

TROUBLE	POSSIBLE CAUSE
Unable to obtain the correct meter reading.	<ol style="list-style-type: none"> Channel #3 Stick control, R19, is incorrectly wired. Diode D5 is incorrectly installed or shorted. Channel #3 Range control, R31, is the wrong value.
Meter fluctuates.	<ol style="list-style-type: none"> Channel 4, 6, 7, and 8 controls are not correctly centered. Recheck the approximate center of these controls.

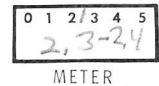
- () Connect the red meter lead to lug 1 of channel #2 Range control. Mark this meter reading on the meter face at the right. This will be the reference for the next adjustment.



- () Connect the red meter lead to lug 1 of the channel #4 Range control.
- () Adjust the Auxiliary channel #4 control thumb knob until the meter reads the same as the reference meter reading.
- () Without turning the control shaft now, grasp the shaft with a pair of pliers and center the thumb knob.

TROUBLE	POSSIBLE CAUSE
Unable to obtain the correct meter reading.	<ol style="list-style-type: none"> Channel #4 Stick control, R26, is incorrectly wired. Diode 8 is incorrectly installed or shorted. Channel #4 Range control, R34, is the wrong value.
Meter fluctuates.	<ol style="list-style-type: none"> Channel 6, 7, and 8 controls are not correctly centered. Recheck the approximate center of these controls.

- () Connect the red meter lead to lug 1 of channel #2 Range control. Mark this meter reading on the meter face at the right. This will be the reference for the next adjustment.

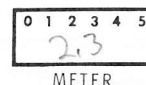


- () Connect the red meter lead to lug 1 of the channel #6 Range control.
- () Adjust the channel #6 Auxiliary control thumb knob until the meter reads the same as the reference meter reading.
- () Without turning the control shaft, grasp the shaft with a pair of pliers and center the thumb knob.

TROUBLE	POSSIBLE CAUSE
Unable to obtain the correct meter reading.	<ol style="list-style-type: none"> Thumb knob is not centered on the control shaft. Channel #6 Auxiliary control, R32, is incorrectly wired. Diode D9 is incorrectly installed or shorted. Channel #6 Range control, R35, is the wrong value.
Meter fluctuates.	<ol style="list-style-type: none"> Channel 7 and 8 controls are not correctly centered. Recheck the approximate center of these controls.



- () Connect the red meter lead to lug 1 of channel #2 Range control. Mark this meter reading on the meter face at the right. This will be the reference for the next adjustment.



- () Connect the red meter lead to lug 1 of the channel #7 Range control.
- () Adjust the channel #7 Auxiliary control thumb knob until the meter reads the same as the reference meter reading.
- () Without turning the control shaft, grasp the shaft with a pair of pliers and center the thumb knob.

TROUBLE	POSSIBLE CAUSE
Unable to obtain the correct meter reading	<ol style="list-style-type: none"> 1. Thumb knob is not centered on the control shaft. 2. Channel #7 Auxiliary control, R24, is incorrectly wired. 3. Diode D6 is incorrectly installed or shorted. 4. Channel #7 Range control, R32, is the wrong value.
Meter fluctuates.	<ol style="list-style-type: none"> 1. Channel 8 control is not correctly centered. Recheck the approximate center of this control.

- () Connect the red meter lead to lug 1 of channel #2 Range control. Mark this meter reading on the meter face at the right. This will be the reference for the next adjustment.



- () Connect the red meter lead to lug 1 of the channel #8 Range control.
- () Adjust the channel #8 Auxiliary control thumb knob until the meter reads the same as the reference meter reading.
- () Without turning the channel shaft, grasp the shaft with a pair of pliers and move the thumb knob to its center position.

TROUBLE	POSSIBLE CAUSE
Unable to obtain the correct meter reading.	<ol style="list-style-type: none"> 1. Thumb knob is not centered on the control shaft. 2. Channel #8 Auxiliary control, R28, is wired incorrectly. 3. Diode D10 is incorrectly installed or shorted. 4. Channel #8 Range control, R36, is the wrong value.

- () Disconnect the red and black meter leads.
- () Turn the Transmitter Off.

This completes the "Test and Adjustments" section. Set the Transmitter aside and proceed to the Receiver "Test and Adjustments." The meter used in the alignment of the Transmitter will also be used in the Receiver.

After completing the Receiver "Test and Adjustments," return to the "Centering and Travel" section in this Manual.

CENTERING AND TRAVEL

CENTERING

In the following steps you will adjust the Servos using channel #2 in the Transmitter as a reference. Do not make these adjustments on any other channel.

- () Connect a Servo to channel #2 on your Receiver.

NOTE: As you turn the shaft in the following adjustment, the rotary output post will turn in the opposite direction. It may be necessary to repeat this adjustment several times to get the rotary output post properly positioned.

- () Turn the Receiver and Transmitter On.

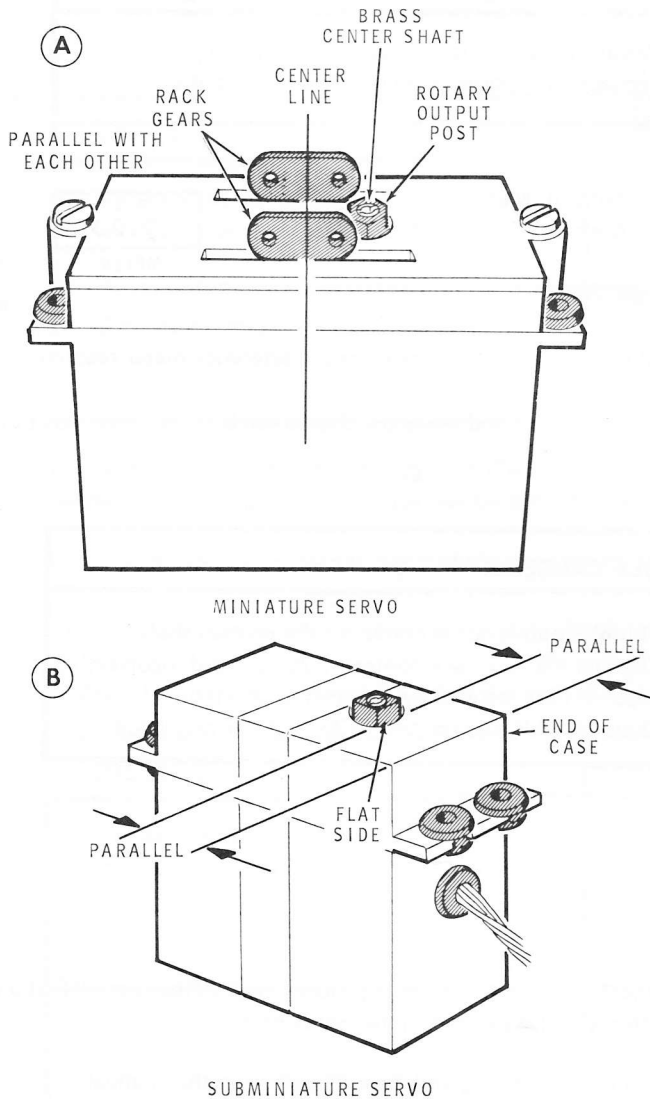


Figure 1-4

- () Insert a small screwdriver in the slot in the brass center shaft. Then turn the brass center shaft until the output post or rack gears are positioned as shown in Figure 1-4.

If the Servo does not operate properly, refer to the "In Case of Difficulty" section in the Servo Manual.

- () Repeat this same adjustment on the other Servos.
- () Turn the Receiver and Transmitter Off.
- () Unsolder the 60 kΩ resistor from lug 1 of the channel #2 Range control and lug 2 of the Auxiliary channel #8 control.

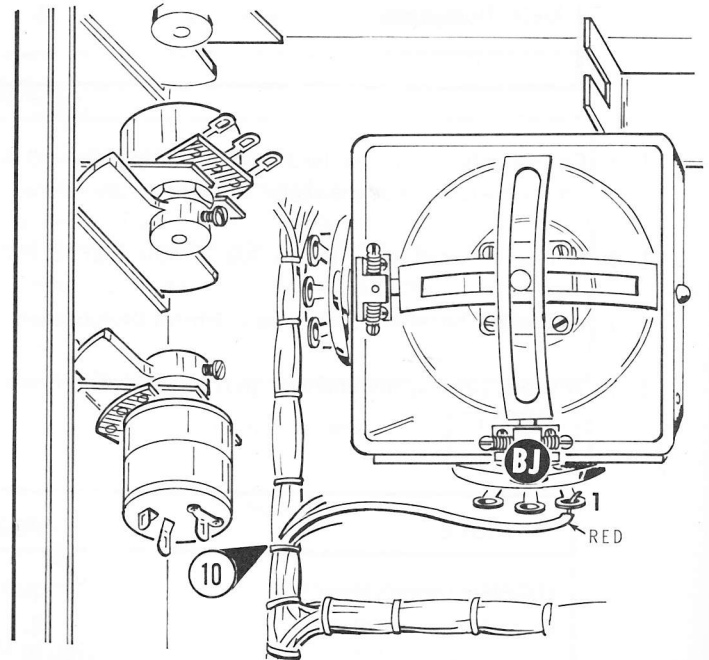
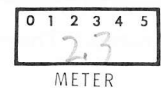


Figure 1-5

- () Refer to Figure 1-5 and connect the red wire coming from BO#10 to lug 1 on control BJ (S-1).
- () Connect the black meter lead to the free end of the GESTB620 diode.

- () Turn the Transmitter On.



- () Connect the red meter lead to lug 1 of the channel #1 Range control. Mark the reading on the meter face at the right.

- () Connect the red meter lead to lug 1 of the channel #2 Range control. Then grasp the body of the channel #2 Stick control in your fingers and turn it until the meter reads the same as the previous step.

TROUBLE	POSSIBLE CAUSE
Unable to obtain the correct meter reading.	1. Channel #2 Stick control, R25, is incorrectly wired. 2. Diode D7 incorrectly installed or shorted. 3. Channel #2 Range control is wrong value.

- () Turn the Transmitter Off.
- () Disconnect the meter leads.
- () Unsolder the 5100 Ω resistor from solder lug D.

In the following steps, each of the eight Transmitter channels will be checked and adjusted. This is to make sure that the Servo that is connected to this channel will center properly and travel the proper distance in each direction. Use the following six-step procedure to adjust each channel. Refer to Figure 1-6 (fold-out from Page 47) for the following steps.

ADJUSTMENT PROCEDURE

1. Connect the cable of the master Servo to the channel referred to on the Receiver connector block. Then turn the Transmitter and Receiver On.

NOTE: To adjust an Auxiliary control, hold the end of the control shaft with a pair of pliers and move the thumb knob on the shaft.

2. Operate the specified Stick or Auxiliary control slowly through its entire range. Be sure the trim tab is in the center position. The Servo should move in each direction as shown in Figure 1-6.
3. If the Servo travel is correct in each direction, proceed to step #6. NOTE: The rack gears (Miniature Servo only) must not touch the ends of the slots in the servo case.

4. If the post (or rack gears) do not travel far enough, turn the Range control for that channel (on the encoder circuit board) counterclockwise a small amount. Then readjust the Channel control so that the Servo is centered again. Repeat steps 2 and 4 until the Servo travels the correct distance.
5. If the post (or rack gears) travel too far, turn the Range control for that channel (on the encoder circuit board) clockwise a small amount. Then readjust the Channel control so that the Servo is centered again. Repeat steps 2 and 5 until the Servo travels the correct distance.
6. Move the Trim Tab to one end and then the other while you operate the stick through its entire range. Make sure the rack gears (Miniature Servo only) do not touch the ends of the slots in the servo case. If they do touch, repeat step 5.

ADJUSTMENTS

Adjust each of the following channels using a Servo and the procedure just described.

- () Turn the Transmitter and Receiver On.
- () Channel #1.
- () Channel #2.
- () Channel #3. NOTE: To center the Servo for this channel, remove the Rudder control knob, adjust the control shaft, and replace the knob.
- () Channel #4.
- () Channel #6. NOTE: Channel #5 will be adjusted last.
- () Channel #7.
- () Channel #8.

In the following steps, you will adjust the switched channel (Channel #5). Note that there are two Range controls on the encoder circuit board for channel #5. One of these controls sets in from the edge of the circuit board and the other control sets near the edge of the circuit board in line with the other Range controls.

- () Set the channel #5 switch (on the left side of the Transmitter) so that the thumb knob is toward the front of the Transmitter.
- () Connect a Servo to channel #5 on the Receiver.

- () Adjust the channel #5 Range control (that is in from the edge of the circuit board), counterclockwise until the rotary output post or rack gears are at their approximate center position.
- () Now adjust the same channel #5 Range control counterclockwise until the rotary output post or rack gears are at the desired end position (refer to Figure 1-6). NOTE: The rack gears must not actually touch the end of the slots in the servo case.

TROUBLE	POSSIBLE CAUSE
Unable to obtain correct results.	1. Channel #5 Range control R23 or R22.

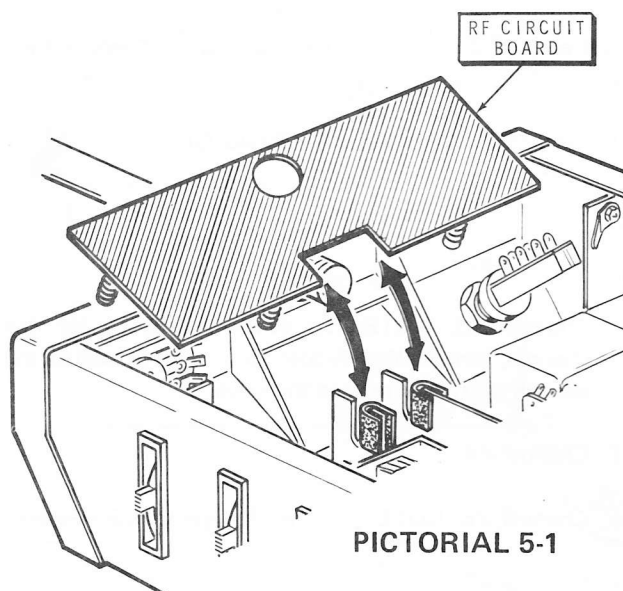
- () Set the channel #5 switch so that the thumb knob is toward the rear panel.
- () Adjust the channel #5 Range control (that is near the edge of the circuit board) clockwise so the rotary output post or rack gears are at the desired end position the other way.

NOTE: If your system requires that the channel #5 Servo does not travel full in both directions, adjust these Range controls to obtain the desired amount of travel.

- () Turn the Transmitter and Receiver Off.
- () Check the thumb knobs to make sure they are tight on the shafts.

This completes the adjustments of your system. Proceed to "Final Assembly."

FINAL ASSEMBLY



PICTORIAL 5-1

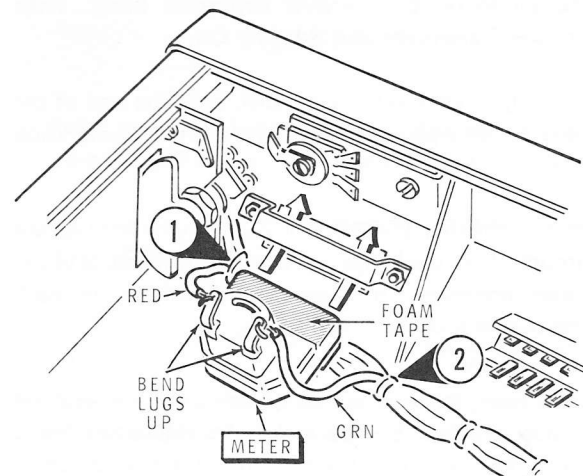
Refer to Pictorial 5-1 for the following steps.

- () Extend the outer section of the antenna all the way out of the Transmitter as shown.
- () Remove the rf circuit board by pulling up on it. Be careful that you do not break any wires connected to the circuit board.

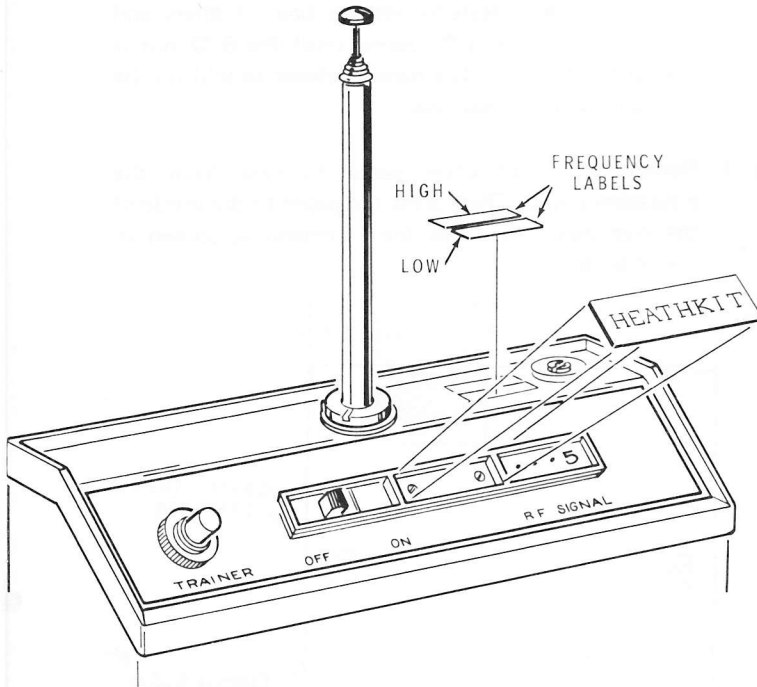
Refer to Pictorial 5-2 for the following steps.

- () Locate the test meter and unsolder both test leads from the meter lugs.

- () Bend the meter lugs forward as shown.
- () Cut a 1" length of foam tape. Then remove the protective backing from the tape and press the tape against the back of the meter as shown.
- () Slide the meter under the meter bracket. It may be necessary to loosen the meter bracket. Be sure the wiring harness is clear.
- () Connect the red wire coming from BO#1 to the plus (+) marked meter lug (S-1).
- () Connect the green wire coming from BO#2 to the negative (-) marked meter lug (S-1).
- () Replace the rf circuit board by sliding it down into the rf circuit board bracket.



PICTORIAL 5-2



PICTORIAL 5-5

Refer to Pictorial 5-5 for the following steps.

- () Peel the protective backing paper from the back of the Heathkit nameplate. Then press the nameplate into place on the top of the Transmitter.

Refer to the crystal frequencies that you wrote on the back cover of this Manual for the following steps.

Perform the steps for the band that your Transmitter is operating on.

27 MHz and 53 MHz Band

- () Locate the higher of the two frequencies on the frequency label sheet. Then remove this label from the sheet and press it into place on top of the Transmitter near the rear of the top.
- () Locate the other crystal frequency label and press it in place on the top of the Transmitter.

72 MHz Band

- () Multiply both of the frequencies that you wrote on the back cover of this Manual by two. This number will be the frequency of your Transmitter.
- () Locate the higher of these two frequencies on the frequency label sheet. Then remove this label from the sheet and press it into place on top of the Transmitter near the rear of the top.
- () Locate the other frequency label and press it in place on the top of the Transmitter.

This completes the assembly of your Transmitter. Proceed to the "Operations" section.

OPERATION

PREFLIGHT CHECKS

Binding

After the Receiver and Servos have been installed, operate all the controls to see that the Servos function properly and without binding. This will keep Servo overload and battery drain to a minimum.

Vibration

To be sure your mechanical connections and construction do not fail during flight, you should have someone hold your model so it will not fly, and then start the engine. Run a couple tanks of fuel through the engine. At the same time, operate all the controls to see that they perform faultlessly at all engine speeds.

Meter

Place the Power switch in the On position and observe the meter. With the antenna fully extended and the Transmitter being held, the meter should read between 4 and 5. If the meter reads less than 3, recharge the batteries before you operate the Transmitter. See "Battery Charging" on Page 38.

Range Check

If the range shown in the following chart cannot be achieved, recheck the Receiver antenna to be sure it is placed as directed in the Receiver-Antenna section on Page 42 of the Receiver Manual. The Receiver antenna should be fully extended. The indoor range may be greatly increased or reduced from this figure due to reflections from metal objects.

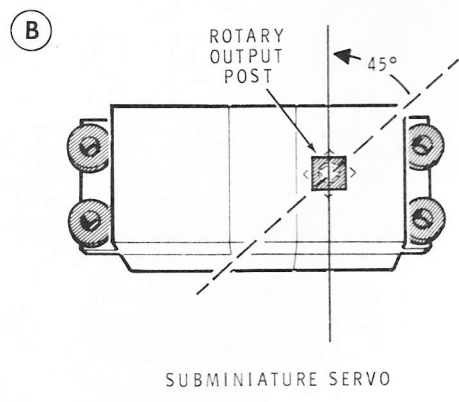
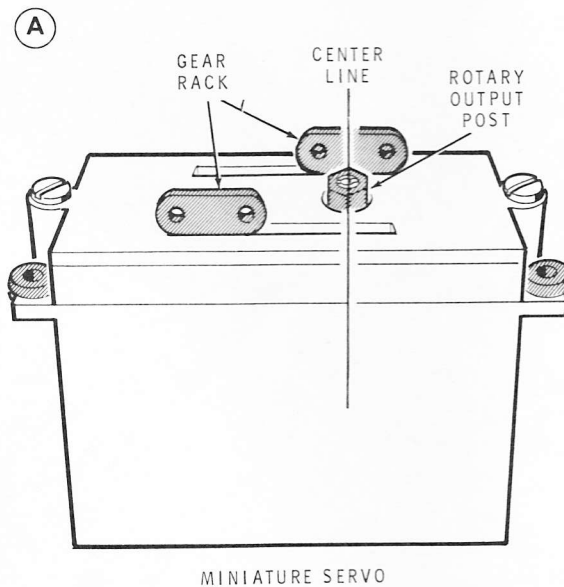


Figure 1-6