Built 9-1-77

1/2A-2 TWO CHANNEL RECEIVER

ASSEMBLY INSTRUCTIONS

INTRODUCTION

The 1/2A-2 two channel receiver was designed specifically for 1/2A sport or competition flying on the 72-75 MHZ R/C frequency band. It's small, lightweight, easy to build and maintain, and will work quite well with any good quality 72mhz transmitter as long as the first two channels transmitted are the ones you want to use.

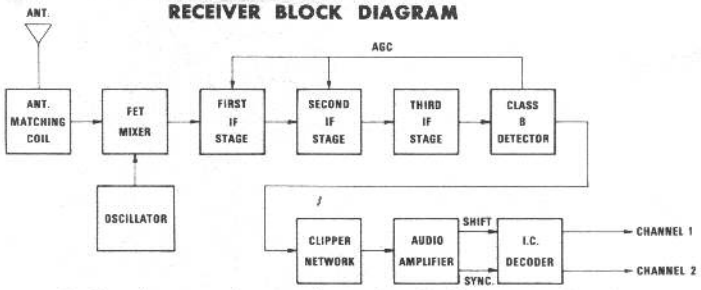
Servos: The 1/2A-2 will work with most positive pulse 3 wire or 4 wire servo of your choice.

Battery Pack: Again this is up to you and your requirements. But for 1/2A flying a 225mah or 100mah (fast charge) pack is suggested for weight reasons.

Connectors: The 200R presented here is shown with a Multicon connector block available from Royal Electronics and for all practical purposes, is your best bet to minimize connector wiring. However, you may wish to use another connector to match your present system. It really doesn't matter. How you want to set up this system is entirely up to you.

Electronically, the 1/2A-2 is a superhetrodyne of very simple design. It exhibits good sensitivity, low noise and maintains good stability. Its small size is accomplished by using a FET mixer, a very simple decoder and an efficient use of printed circuit board space. The low component count also increases reliability and saves time when searching for any problem area.

RECEIVER BLOCK DIAGRAM



Referring to the receiver block diagram, the single front end coil is tapped for 72 and 75MHZ to better match the antenna impedance. No secondary winding is required to feed the FET because of its high input impedance as is normally found in receivers which use transistor mixers.

The FET provides better mixing efficiency, a wider dynamic range, less mixing distortion and a lower noise input than most transistors. The secondary of the oscilator coil supplies the injection voltage to the drain of the FET. The source of the FET is connected to the first I.F. transformer in the same manner as a conventional transistor stage. The local oscillator is a Pierce oscillator which operates at the desired frequency 455KC below or above the incoming transmitted frequency.

The I.F. amplifiers are standard and straightforward. The detector transistor operates as a class B detector and also supplies AGC to the I.F. amplifiers. The detected signal is passed through a high level clipper circuit to the audio amplifier transistor. This clipper circuit greatly reduces interference from unwanted signals.

The audio amplifier transistor shapes the signal into a negative going square wave to clock the dual J-K flip flop integrated circuit decoder. Reset or sync of the decoder is achieved by way of a very simple circuit consisting of one diode and one capacitor. Reset occurs approximately 6 milliseconds after the last pulse in the transmitted train is received. Output at the flip flop is a positive going square wave which is fed to the servos.

Now then, if you haven't built an electronics kit or project before, use your own judgement as to whether you should try this one or not. Remember it's very small and tight. I have attempted to write the assembly instructions as simple and complete as possible. Do what I tell you, as the saying goes, and you should have little or no problem at all. If you think you can build this receiver with parts from the electronics bargain store or complete it in an hour, you are very wrong. Use only the components listed (available from Royal Electronics-Englewood, Colorado) and take your time in construction.

When you've got everything required to build the receiver, organize your work area. No metal tables. PLEASE Spread out a light colored towel directly in front of you and group the components near the top. Transistors together, resistors together, etc. This keeps everything in order. No parts lost on the floor.

Tools Needed:

1. Small Dikes.
2. Soldering iron with a 1/16in dia. tip or smaller.
3. Needle nose pliers.
4. Pin Vise with #69 Drill.
5. Cleaning fluid, such as 1,1,1-Trichloroethane.
6. Small brush.
7. Wire strippers.

CONSTRUCTION NOTES:

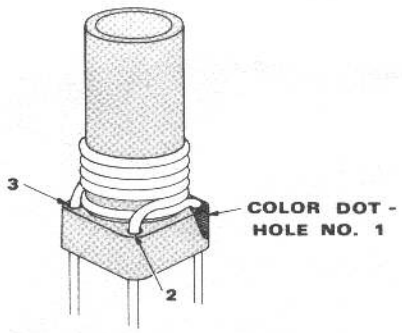
A. ( ) Check parts supplied against the parts list. Coils will be supplied wound if at all possible. If it is necessary to wind coils perform the following steps.

B. (✓) Paint one corner of the coil form using enamel of any color. This indicates hole #1 for winding instructions and P.C. board location.

C. (✓) Slip the empty coil form down over the end of a small paint brush handle or something similar to act as a winding handle. The form should be pushed on until it is snug but not tight.

D. (✓) Refering to Fig. (1), slip 2" of a 12" length of #26 enamaled magnet wire down through hole #1. Use masking tape to secure the wire to the handle and begin winding in a clockwise (viewed from the top) direction. Wind 1-1/4 turn ending at hole #2. Pass the wire down through the hole, tug the wire gently and secure it to the handle. Without snipping the wire, bring it back up through hole #3 and continue winding 4-1/4 turns terminating at hole #4. Keep the turns close and neat. Pass the wire down through hole #4. Give the wire an extra tug and tape the wire to the handle.

L 3



WIND 1¼ TURNS HOLE NO. 1 TO HOLE NO. 2

WIND 4¼ TURNS HOLE NO. 3 TO HOLE NO. 4

E. (✓) Examine the coil. The turns should be close and neat. If not, go back and tug the wires again from below the masking tape. Recount the turns to be sure they are the correct number. If not, rewind as necessary.

½A 2 Channel Reciver
Parts List

Ref. No.	Quan.	Description	R.E. Part No.	Price Each
R9	1	1K ¼W. 10% Resistor	000031	.12
R15	1	3.9K ¼W. 10% Resistor	000038	.12
R16	1	4.7K ¼W. 10% Resistor	000039	.12
R12	1	5.6K ¼W. 10% Resistor	000040	.12
R4,10	2	15K ¼W. 10% Resistor	000045	.12
R8	1	18K ¼W. 10% Resistor	000046	.12
R11,13	2	22K ¼W. 10% Resistor	000047	.12
R7	1	56K ¼W. 10% Resistor	000052	.12
R14	1	100K ¼W. 10% Resistor	000055	.12
C1,13	2	.001 uf Disc Capacitor	001035	.30
C14	1	.01 uf Disc Capacitor	001044	.35
C9,10	2	.05 uf Disc Capacitor	001049	.35
C7	1	.1 uf Disc Capacitor	001050	.40
C4,15	2	.47 uf Tantalum Cap	001127	.95
C11	1	1.0 uf Tantalum Cap	001135	.95
C6	1	4.7 uf Tantalum Cap	001141	.95
C16	1	15 uf 6V Tantalum Cap	001150	1.10
C8,12	2	33 uf Tantalum Cap	001160	1.20
Q2	1	2N5457 Fet	000453	1.50
Q1,3,4	3	MPS 3563 Transistor	000464	.95
Q5,6,7	3	M 400 Transistor	000443	.65
D1,2,3	3	IN 4148 Diode	000405	.40
IC 1	1	74L73 I.C.	000436	2.50
T1	1	If Transformer,Toko,Yel.	000897	1.80
T2	1	If Transformer, Toko,Wht.	000898	1.80
T3	1	If Transformer,Toko,Black	000899	1.80
	36"	#26 G. Hookup Wire, White		.15
	6"ea	#26 G. Hookup Wire, Red/Wht. Brown, Red, Black		.10
		Optional Connectors		
	1"ea.	#26 Enameled Magnet Wire		.05
	1	¼" Grommet		.10
	1	Crystal, 5th Overtone		5.25
	1	P C Board ½A-2		1.95
	1	Receiver Case		2.00

The following vales determined by frequency:

	27 MHZ	Part No.	Price	53 MHZ	Part No.	Price	72/75MHZ	Part No.	Price
R1	1	-		82K	000054	.12	100 K	000055	.12
R2	1	-		470 OHM	000027	.12	100 OHM	000019	.12
R3	1	-							
R5	1	-		100 OHM	000019	.12	680 OHM	000029	.12
R6	1	-		220 OHM	000023	.12	100 OHM	000019	.12
C2	1	-		22 pf	001013	.40	22 pf	001013	.40
C3	1	-		10 pf	001008	.40	10 pf	001008	.40
C5	1	-		30 pf	001016	.40	15 pf	001010	.40
L1	1	-		4.7 uhy	000465	.45	82 uhy	000469	.45
L3	1	-		1 3/4-6 3/4	005377	1.00	1¼-4¼	005377	1.00

F. (✓) Secure the wire to the form by smearing Duco or Ambroid cement or a very small amount of epoxy over the wire and completely around the form. DO NOT glue the form to the handle. Set the completed coil still on the handle aside to dry or cure.

G. (✓) Find the .82 uh choke. Center a 3" length of #26 enamaled magnet wire over the center of the choke and proceed to wrap 6 tight turns around it. Direction of turns is unimportant. Holding the ends of the completed secondary coil, glue it to the choke in the same manner as the coil form above. Set aside to dry or cure.

H. (✓) Locate the P.C. board and test fit it into the case. It should drop in with its edges just touching the inside walls. If not, carefully sand the Epoxy board edges down to the Clad until it does fit.

I. (✓) Now check the board to be sure all the holes have been drilled. If not, use a #68 drill bit to complete the board. The holes for the I.F. can CASE pins should be #55.

L1-L2

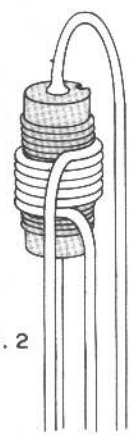


FIG. 2

WIND 6 TURNS AROUND CHOKE

J. ( ) Find the three I.F. cans. These look like little chrome cubes with colored slugs in one end. You should have one each; yellow, white and black. Refer to Fig. (4 and 5) and snip one lead from each can. BE CAREFUL. Snip only the lead indicated.

( ) Refer to the component overlay, Fig. 3 and test fit the I.F. cans in their respective locations. They should go down completely onto the board. If needed, carefully enlarge any of the holes to accomplish this. Remove the cans and set aside. DO NOT solder them in place at this time.

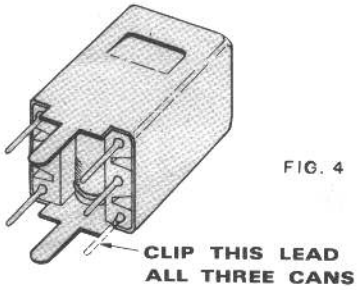


FIG. 4

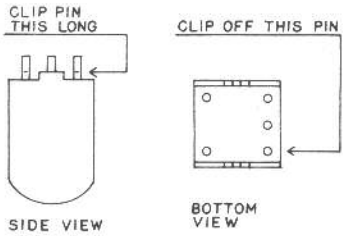
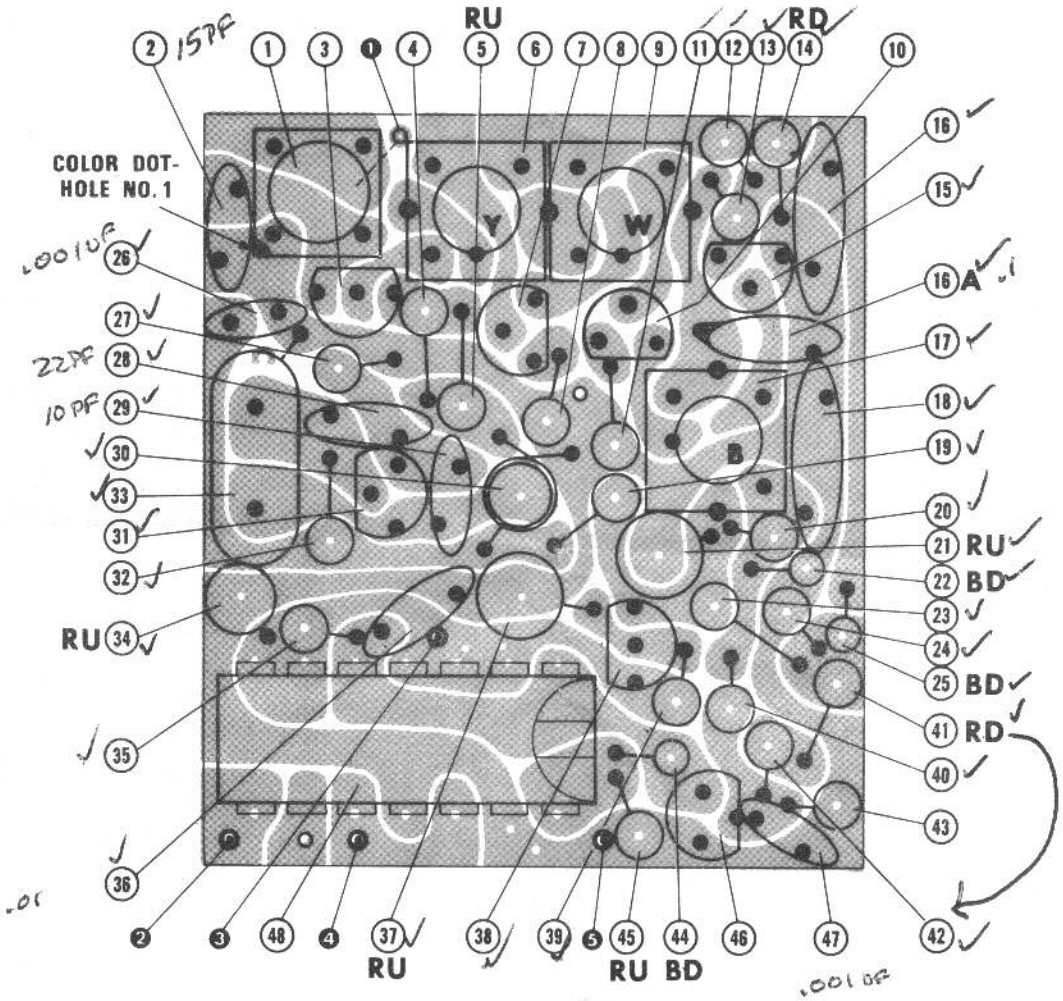


FIG. 5



COMPONENT OVERLAY FIG. 3

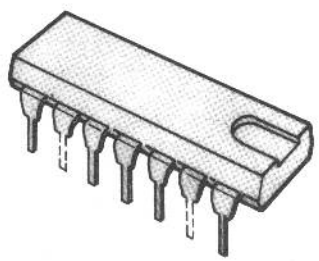
As you proceed with the assembly of the board it's important to remember to use only 60/40 resin core solder of #21 Gage or smaller diameter. The small diameter aids in restricting the amount of solder melted at a joint on the board. You do not need anymore solder than just enough to encircle the lead where it projects through the hole. Excess solder is also one easy way to form a solder "bridge". This is where the solder flows from one circuit land to another causing an electrical short. If this does happen, use solder wick or a desoldering bulb to remove it. As a last resort, carve it out with an exacto knife.

When soldering, touch the iron to one side of the component lead and the circuit land at the same time. Quickly touch the solder to the other side of the lead and when the solder has flowed around the lead, pull the solder away and slide the iron tip up the component lead and away. The total time for this operation should NEVER take more than three or four seconds. If the time to make a bright and complete solder joint takes any longer than this, either the soldering iron is inefficient and cold or the component lead is filmed or dirty. Improper type of solder could also be the culprit. It is always a good idea to wipe the component leads clean before inserting the part into the board. Once the component lead has been run through the P.C. board, bend the lead over next to the Clad, clip the lead 1/32 to 1/64 from the bend. Use a good set of dikes or even a sharp fingernail clipper.

P.C. BOARD ASSEMBLY

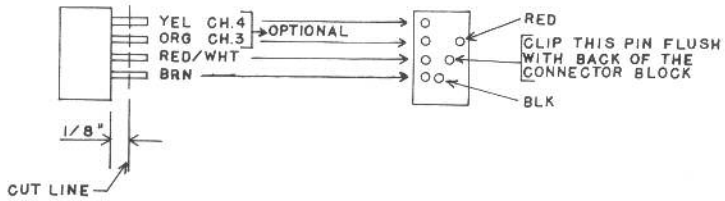
NOTE: Assemble the components in the following order ONLY.

1. ( ) Use an exacto knife to scrape the coil form leads clean. Insert the form into the board, carefully observing the location of the color dot. Spread the leads from the bottom and solder all four leads in place.
2. ( ) Install and solder a C5 capacitor next to the coil form, 15pf - 72MHZ.
3. ( ) Install the 2N5457 FET, orient it according to the overlay, and solder in place.
4. ( ) Install and solder a 15K resistor. (brn. grn. org. silv.).
5. ( ) Install and solder a .47uf tantalum capacitor, red end up.
6. ( ) Install and solder the yellow I.F. can in place. NOTE: Do not solder the can lug which will share a hole with a white I.F. can lug.
7. ( ) Install and solder a 2N3563 transistor. Be sure the transistor is oriented correctly.
8. ( ) Install and solder a R5, 72MHZ 100 ohm (brn. blk. brn. silv.).
9. ( ) Install and solder the white I.F. can into place. Remember to also solder the yellow I.F. can case lug not done in step 6.
10. ( ) Install and solder a 2N3563 transistor. Note proper orientation.
11. ( ) Install and solder a 100 ohm resistor. (brn. blk. brn. silv.).
12. ( ) Install and solder a 56K resistor. (grn. blu. org. silv.).
13. ( ) Install and solder a 1K resistor. (brn. blk. red, silv.).
14. ( ) Install and solder a 4.7uf tantalum capacitor with the red end toward the P.C. board.
15. ( ) Install and solder a M400 or 2N4124 transistor noting proper orientation.
16. ( ) Install and solder an .05uf disc capacitor. You may need to clean some of the ceramic mat- shown.
17. ( ) Install and solder the black I.F. can.
18. ( ) Install and solder an .05uf disc capacitor.
19. ( ) Install and solder a 680 ohm resistor. (blu. grey, brn. silv.).
20. ( ) Install and solder an 18K resistor.
21. ( ) Install and solder a 33uf tantalum capacitor with the red end up.
22. ( ) Install and solder a 1N4148 diode in place with the banded end down.
23. ( ) Install and solder a 15K resistor. (brn. grn. org. silv.)
24. ( ) Install and solder a 22K resistor. (red, red, org. silv.)
25. ( ) Install and solder a 1N4148 diode with the banded end down.
26. ( ) Install and solder a .001uf disc capacitor.
27. ( ) Install and solder a 100 ohm resistor. (brn. blk. brn. silv.)
28. ( ) Install and solder a 22pf disc capacitor.
29. ( ) Install and solder a 10pf disc capacitor.
30. ( ) Install and solder the .82 uh choke with the secondary coil wound around it in position. Bend the leads straight down and observe the proper holes for the secondary windings. Be sure to clean the insulation from the wire of the secondary where it exits the holes so that it will solder properly.
31. ( ) Install and solder a 2N3563 transistor noting proper orientation.
32. ( ) Install and solder a 100K resistor. (brn. blk. yel. silv.)
33. ( ) Solder a short length of resistor remnant to the end of the crystal case opposite the end with solder seal on it. The wire should be placed near the top of the case. Be sure the wire is long enough so that it will go thru the hole noted in the P.C. board. Then solder the crystal and case lead into position. Also be sure the crystal is placed as near to the P.C. board as possible.
34. ( ) Install and solder a 15uf tantalum capacitor with the red end up.
35. ( ) Install and solder a 4.7K resistor in place. (yel. purp. red, silv.)
36. ( ) Install and solder a .01 disc capacitor in place.
37. ( ) Install and solder a 33uf tantalum capacitor with the red end up.
38. ( ) Install and solder a M400 or 2N4124 transistor in position noting proper orientation.
39. ( ) Install and solder a 3.9K resistor in place. (org. wht. red, silv.)
40. ( ) Install and solder a 22K resistor. (red, red, org. silv.)
41. ( ) Install and solder a 5.6K resistor. (grn. blu. red silv.)
42. ( ) Install and solder a 1.0uf tantalum capacitor in place with the red end down.
43. ( ) Install and solder a 100K resistor. (brn, blk. yel. silv.)
44. ( ) Install and solder a 1N4148 diode in place with the banded end down.
45. ( ) Install and solder a .47uf tantalum capacitor with the red end up.
46. ( ) Install and solder a M400 or 2N4124 transistor in place noting proper orientation.
47. ( ) Install and solder a .001uf disc capacitor.
48. ( ) Observing the indexing mark on the top of the integrated circuit, snip off pins 9 and 13. Holding the I.C. in front of you with the index to your right, pins 9 and 13 will be the second and sixth pins from the left on the bottom. As there are no holes in the P.C. board for these pins, you can also check for them by trying to install the I.C. in the board. You won't be able to get it in because pins 9 and 13 will block it. Once this is done, install and solder the I.C. marked Sn74173. Be sure it is mounted as shown on the overlay. This completes the component assembly of the receiver. Procede to wiring the board by doing the following;

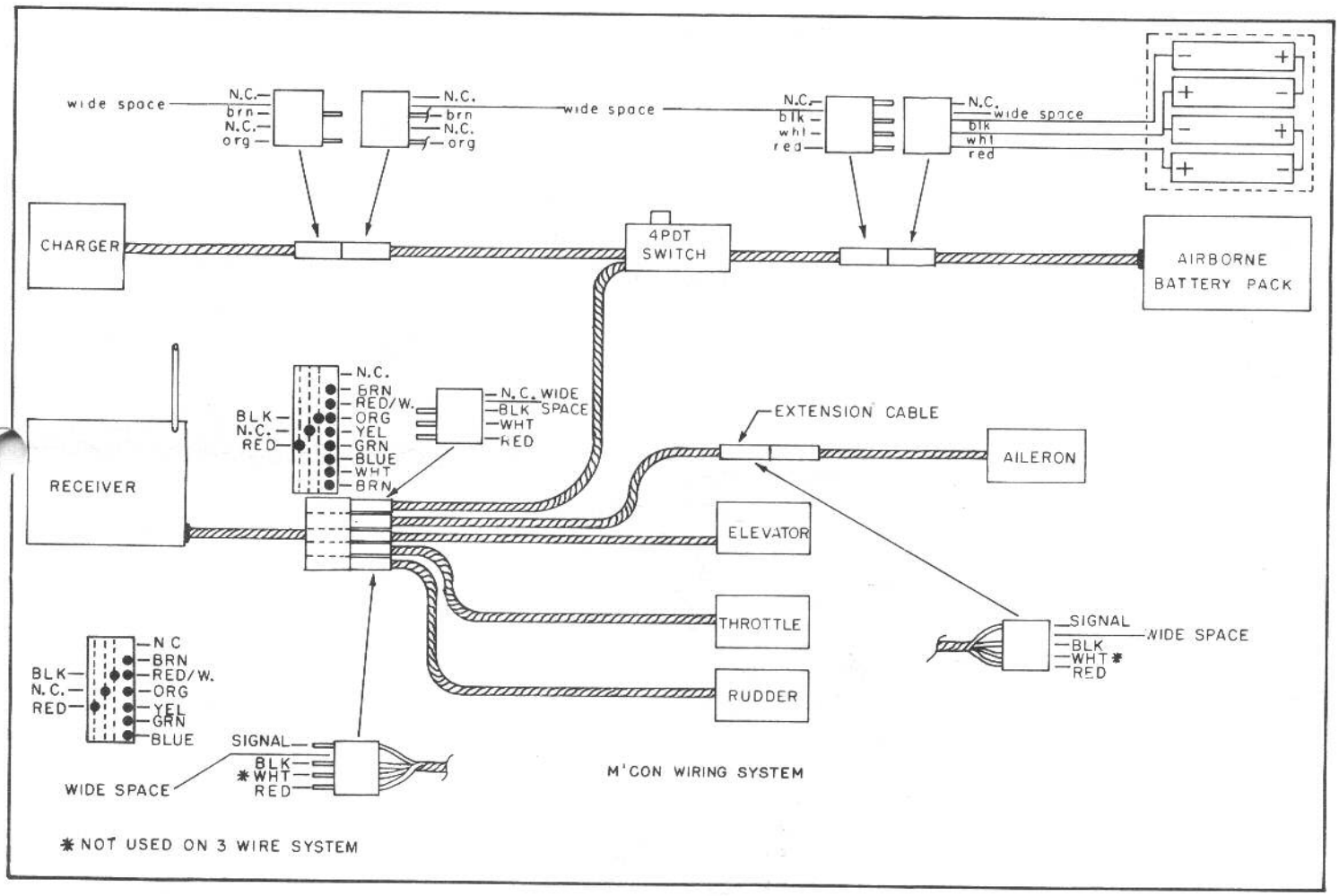


CLIP PINS 9 AND 13 OF I.C. 1

WIRING INSTRUCTIONS:



1. ( ) Find the white antenna wire. It should be 36" long. Strip off 1/8" of insulation from one end, twist the fine wire strands tightly together and pre-tin this end with a small amount of solder. Flip the receiver over so that the circuit side is up and solder the antenna wire to the circuit land as shown in the illustration. This is also noted by the small black "I" circle on the component overlay. Now pass the other end of the antenna wire through the hole drilled next to the yellow I.F. can. If the hole isn't quite large enough, use the sharp end of an X-acto blade to correct this by rotating the blade in the hole. Do not make the hole any larger than is necessary. Pull the wire snug.
2. ( ) Shorten pins on M'con block to 1/8".



3. ( ) All power and signal wires are cut to lengths of 5". You should have one each; red, black , brown and red/wht. Strip off 1/8" of insulation from each end of all four wires. Looking at the illustration, solder one end of each wire to the Multiblock connector as shown. When completed slide a 1/2" piece of heat shrink tubing down each wire and over the connection made at the connector block. Being sure the tubing doesn't move, procede to shrink the tubing by holding them about 1/8" from the soldering iron tip. Shrink them slowly and uniformly. Avoid excess heating of the tubing and try not to touch the connector block or the wires themselves with the soldering iron.

When this is done, pull the wires together and twist them into a tight bundle. Leave about one inch untwisted at the opposite end. Slip the rubber grommet down over the wire bundle and proceed to solder the wires in their respective P.C. board holes. Solder the red wire to hole #3. Shorten the blk wire 1/4". Solder the black wire to hole #5. Solder the brown wire to hole #4, and solder the red/wht wire to hole #2. You may wish to re-twist the wire bundle at this point so that the wires look neat.

4. ( ) Thoroughly clean the clad side of the P C board. Scrub with a tooth brush or acid brush using Trichloroethane, or dope thinner, or alcohol. Absolutely no trace of soldering resin should be left on the PC Board.
5. ( ) Inspect the PC Board soldering and touch up if necessary.

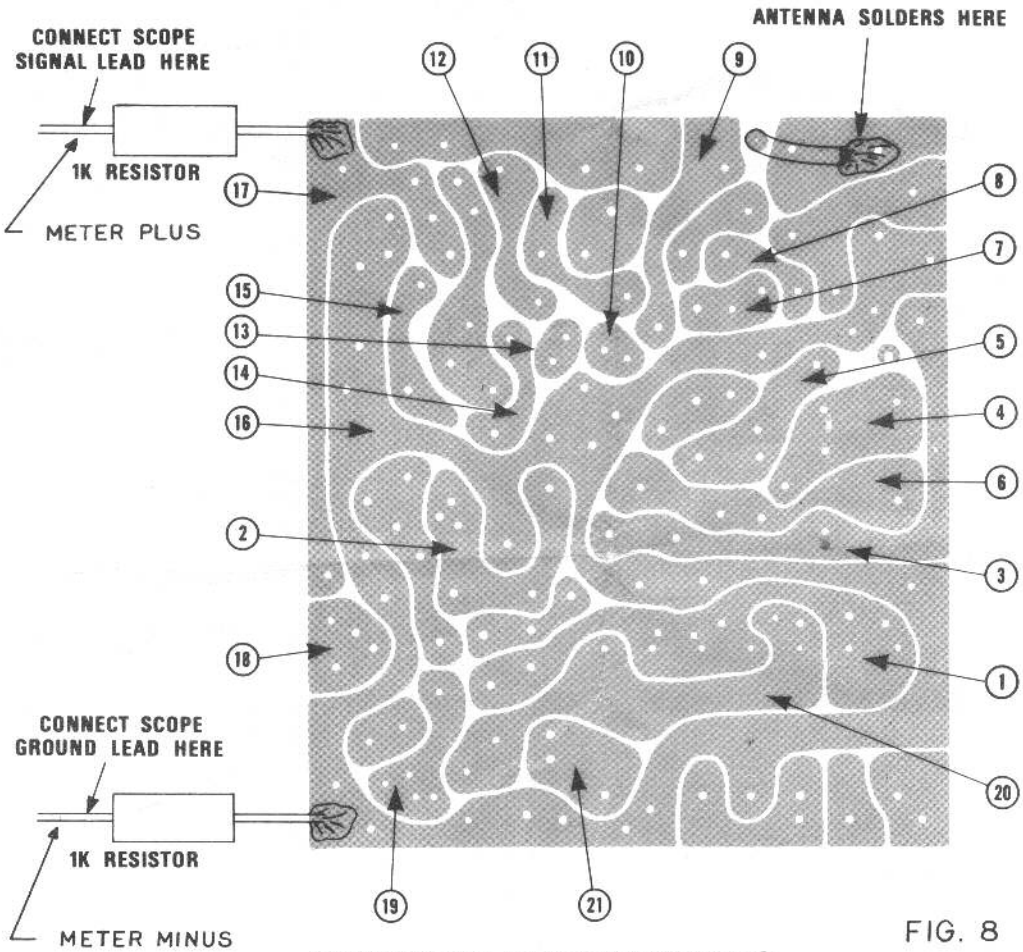
TUNING THE RECEIVER:

1. ( ) Receiver tuning is not complicated if you will simply follow instructions. Remember, the receiver is useless if not tuned properly and will without a doubt bring your airplane down very quickly if you are careless at this point. Take your time and use only the equipment and techniques illustrated here.

2. ( ) As noted before, this receiver is set up for 72-75 MHZ operation and will work beautifully with any transmitter on the appropriate frequency. It does not matter what brand it is or how many channels as long as it has at least two. This receiver will pick off the first two information channels and disregard the rest.

3. ( ) Before tuning be sure all battery packs are fully charged. Rx pack 5.0-5.3VDC. This means the pack you are going to use with the receiver and the transmitter. Do not procede until they are charged!

4. ( ) Flip the receiver over to the circuit side and tak-solder two 1K resistors as shown in the illustration. Fig. 8. Lay a terri-cloth or towel down on the bench in front of you, and place the receiver on it, component side up. One word of caution; NEVER use a metal bench for this procedure. Not only is there a hazard of electrical shock or circuit shorts, the massive amount of metal in the table will DE-TUNE the receiver or hamper proper tuning to an unacceptable level. You may even consider removing large metal objects from the table such as tool boxes.



T. P.	VOLTAGE
1	5.00
2	4.20
3	3.00
4	0 70
5	0.20
6	3.00
7	1.25
8	4.20
9	0.95
10	0.25
11	4.20
12	0.95
13	0.25
14	4.20
15	0.54
16	0.00
17	4.10
18	3.60
19	0.40
20	4.80
21	1.40

FIG. 8

VOLTAGE CHECKPOINTS

SCOPE TUNING:

5A. ( ) Use a DC coupled scope with triggered sweep. Use a 10-1 probe - this means vertical attenuation is set at .1 volts. Turn it on and set the vertical sweep for 1.0 volt per division and the horizontal sweep for 1.0 milisecond per division.

METER METHOD:

5B. ( ) Use a Simpson Model 260 or 270. Set meter on 10 V DC. Hook meter to resistor per voltage check chart.

SCOPE METHOD:

6A. ( ) Hook up the scope leads to the receiver, noting proper polarity on the illustration. Plug in the battery pack plug and turn the switch on. The scope signal sweep should pop up to the 4.0 volt lever or slightly higher. This is the first indication that everthing is normal. Unscrew the antenna from the transmitter and place the transmitter about three feet away. Stretch out the receiver antenna wire on the table top away from all other metal objects or wiring. Turn on the transmitter and you should see a detected wave form. Pick the transmitter up and move it around in all directions in the vicinity of the receiver. You should note that the scope signal will fluctuate as this is done. If no signal appears at all during this excercise, recheck battery hook-up and scope attachment points, and install the transmitter antenna. If this fails to correct the problem it's an indication that something is amiss in the receiver. Whether the problem is poor soldering, improper component placement or a faulty component, now is where you will find it.

Trouble shooting is simple if you follow a systematic approach. The following applies to any radio control device whether it is a transmitter, receiver or servo amplifier.

6B. ( ) Turn on the receiver battery pack. Meter should read approx 4.0 volts D.C. Turn on the transmitter. The meter should show a dip if a signal is coming through the receiver.

7. ( ) First, go back to the assembly instructions and component overlay and recheck EVERY part for proper location and orientation. You may be surprised to fine that you did a no-no in construction. If not, are any of the component leads touching each other? They are not supposed to. If everything on the board checks out as correct proceed to checking voltages. Use the chart and the circuit side illustration to accomplish this. Use a good quality volt meter and hook the common lead to the ground land on the receiver (black plug wire solders here). All voltages should be within about 10% of the value indicated on the chart. If you find a voltage that does not correspond to a given value, you have found the problem. Remove and replace the components at the point where this occurs. As a rule, resistors and disc capacitors can be ruled out as bad unless they show signs of being damaged. On this particular receiver, I would suspect that if any component is faulty, it would be one of the transistors or diodes. The only other parts that could fall under suspicion would be a bad crystal or an I.F. can that has an internal short or imcomplete connection.
If the voltage check procedure turns up nothing, re-hook the receiver to the scope, turn the power and transmitter on and begin wiggling the parts with your fingers. This will find a cold solder joint quicker than anything when all of a sudden the signal on the scope pops on and off. When you have found and repaired the problem, proceed with the tuning. One word of caution; While tuning, avoid leaving the transmitter on without its antenna for periods exceeding 3 or 4 minutes. This can damage the output transistor in some transmitters.
You can usually get all tuning done well within the first 4 minutes anyway.

SCOPE:

8A. ( ) Turn the transmitter on and while observing the scope trace, rotate the coil slug for maximun signal on the scope. Remember to keep the transmitter at least three feet away unless you have had difficulty making a scope trace appear. Move it closer if necessary in the beginning of the procedure to re-establish that you in fact do have a receiver that is operating.
Once the front end coil has been tuned; proceed to tune the yellow I.F. can slug for maximun signal amplitude. Repeat this with the white and finally the black I.F. can slugs.

8B. ( ) Rough tune the R.F. coil and the Yellow, White, Black IF coils for the lowest reading possible on the meter. Each coil should show a definite low point and tuning each side of the low point the meter should start to rise.

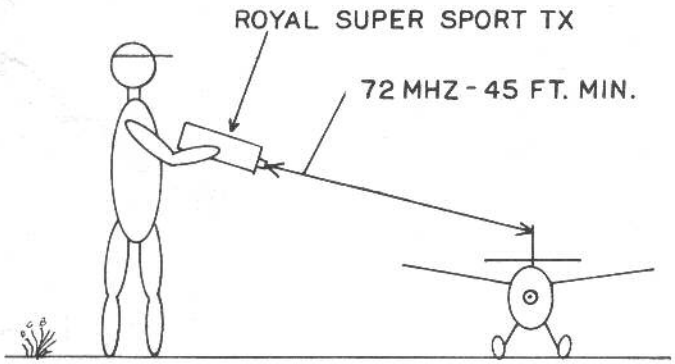
9. ( ) At this point you should have a nice crisp signal trace. Now move the transmitter to a new location, still without the antenna, about 10 to 15 feet away and re-tune all slugs starting with the front-end coil. It won't take much to peak the receiver at this point. You will note that the further the transmitter is moved from the receiver, the touchier the tuning and how little the slugs need be rotated to lose and regain the signal.

9A. ( ) Change the meter setting to 2.5 volts DC full scale. Turn all four coils for the lowest meter reading.

10. ( ) When you are satisfied that the receiver is peaked, turn the transmitter off and unplug the the battery pack from the receiver. Tuning is complete at this point.

11. ( ) Flip the reciver over and unsolder the two tuning resistors. Find a nice stiff brush and clean the circuit side of the board with dope thinner or acetone. Many other solvents will also work. Clean until all the solder joints look bright and all the solder resin is removed. Before placing the receiver in it's case, do a range check. Still without the antenna in the transmitter, take your completed system outside, turn everthing on and start walking. With the Royal Super Sport transmitter the antenna off range check should be 45 ft. min. Variation in range check from one receiver to the next is generally associated with the tolerances to which the electronic components are manufactured.
As an example, of the many prototypes of this receiver constructed, range checks showed a variation from as little as 45 feet to as much as 100 feet. All receivers were built with exactly the same component values. If your receiver falls into a range of less than 50 feet, try replacing the two 100 ohm resistors (#s 8 and 11 on the component overlay) with 82 ohm resistors. You may need to replace the two I.F. transistors (#s 7 and 10 on the overlay). As a resort replace the FET (#3 on the overlay.) Whatever you do on these changes it's a good idea to go back and retune the receiver. The final step in construction of the receiver is to put it in the case. Use ordinary clear cellophane tape to secure the case halves.

ANTENNA OFF RANGE CHECK



Conversion of Dorffler 2 Channel Decoder to 4 Channel

Introduction:

Before starting construction, please read the instructions throughly to familiarize yourself with the IC pin locations. Note that no components need to be removed or changed. Nor are there any PC board changes needed. The third and fourth channel IC is simply added to the existing circuit. The 4 signal leads and 2 power wires were twisted into a 6 wire bundle and terminated at 4" from the decoder onto a 4 channel Multicon Connector block. This eliminates the need for additional power wires from the receiver. If your servos require the battery center tap,(white wire),the multicon block automatically takes care of this requirement.

Steps 1 through 4 apply to "Top IC"

1. (✓) Identify the pins on the SN74L73N IC. Refer to figure 3. The existing SN74L73N IC.(channels 1 and 2), will be referred to as the "bottom IC". The additional IC (channels 3 and 4), will be referred to as the "top IC".
2. (✓) Cut off the leg portion of pins 8,9,13, and 14, (4 pins), on the "top IC". Refer to figure 2.
3. (✓) Tin the wide portion of pins 8,10, and 14. "Top IC".
4. (✓) Bend leg portion of pins 10 and 12,"top IC", to stand straight out from IC body. Pin 11 remains as is.
5. (✓) Tin wide portion of pin 8. "Bottom IC".
6. (✓) Cut one piece of #26 insulated wire 7/8" long. Strip 1/16" and tin both ends.
7. (✓) Solder one end of 7/8" wire to pin 8."Bottom IC".
8. (✓) Place the "top IC" onto the "bottom IC".Make sure that the identifying dents on both IC's are on the same side of the PC board. Pin 1 of the "top IC" should now be lined up with and touching Pin 1 of the "bottom IC". Also pins 2 through 7 and pin 11.
9. (✓) Very carefully solder pin 11 of the "top IC" to pin 11 of the "bottom IC".
10. (✓) Solder pins 1 through 7 of the "top IC" to pins 1 through 7 of the "bottom IC".
11. (✓) Solder the free end of the 7/8" long wire to pin 14 of the "top IC".
12. (✓) Referring to figure 3, bend pins 10 and 12 on the "top IC" to lap each other and solder pin ends together. Make sure they do not touch pin 11.
13. (✓) Cut channel 3 signal wire, (yellow in Royal Electronics kit), 4½" long. Strip one end 1/16" and tin.
14. (✓) Solder channel 3 signal wire to wide portion of pin 10. "Top IC".
15. ( ) Cut channel 4 signal wire (Green in Royal Electronics kit), 4½" long. Strip one end 1/16" and tin.
16. ( ) Solder channel 4 signal wire to wide portion of pin 8. "Top IC"
17. ( ) Use wiring compatable with your servo plugs. Figure 1 shows a wiring system using the Multicon 4CH Receiver Block. This wiring system works with either 3 wire or 4 wire servos.

This completes the conversion of the decoder.

Parts Required:

Quan.	Description	R.E. Part No.	Price
1	SN74L73N	000436	$2.95
1	4CH Multicon Rx. Block	003219	$6.50

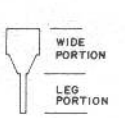


FIG. 2

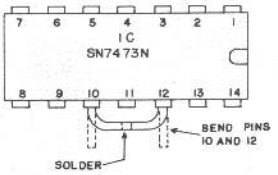
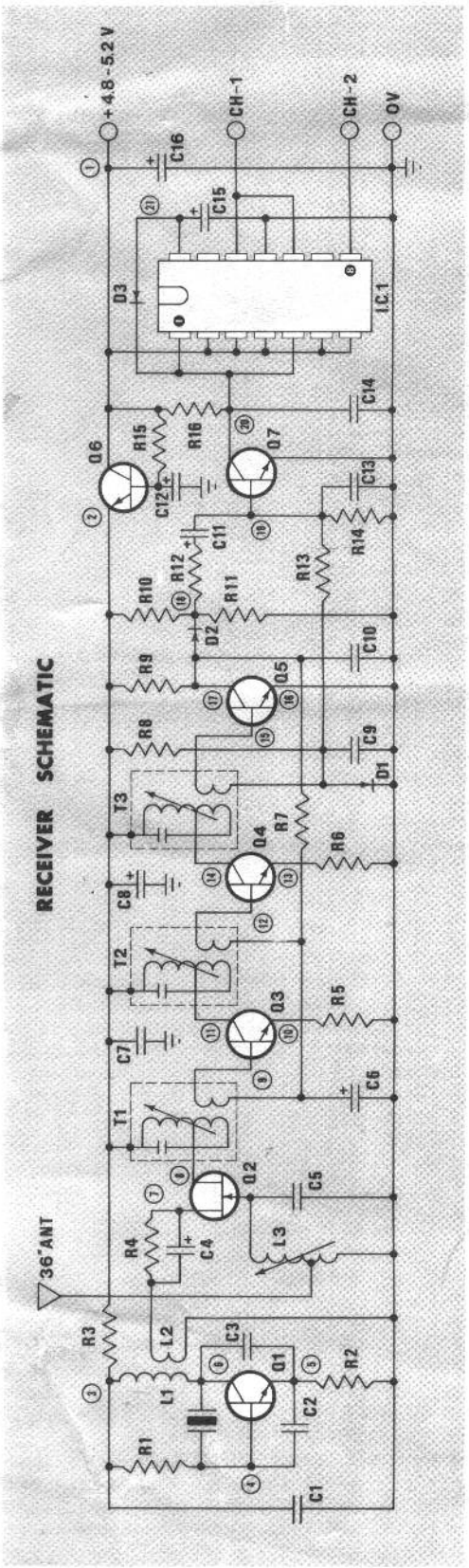


FIG. 3



1/2 A-2 TWO CHANNEL RECEIVER
Correction Sheet 4-1-77

Page 2 Omit frequency parts list and substitute the following:

	27 MHZ	Part No.	Price	53MHZ	Part No.	Price	72/75 MHZ	Part No.	Price
R1	1	-		82K	000054	.12	100K	000055	.12
R2	1	-		270ohm	000027	.12	100ohm	000019	.12
R3	1	-		270ohm	000027	.12	680ohm	000029	.12
R5	1	-		100ohm	000019	.12	100ohm	000019	.12
R6	1	-		100ohm	000023	.12	100ohm	000019	.12
C2	1	-		22pf(223)	001013	.40	22pf(223)	001013	.40
C3	1	-		10pf	001008	.40	10pf	001008	.40
C5	1	-		30pf	001016	.40	15pf (15K)	001010	.40
L1	1	-		4.7uhy	000465	.45	82uhy	000469	.45
L3	1	-		1¼-6 3/4	005378	1.35	1¼-4¼	005377	1.35
CRYSTAL				3rd. O.T.		7.95	5th O.T.		5.25

Page 4. Step 2 Change to read:
Install and solder C5 capacitor next to the coil form, 15pf (15K) - 72MHZ; 30pf-53MHZ

Step 8 Change to read:
Install and solder R5, 72MHZ and 53MHZ, 100ohm resistor (brn,blk,brn,silv.).

Step 11 Change to read:
Install and solder R6 100ohm resistor (brn,blk,brn,silv.).

Add Step:
16A. ( ) Install and solder C7 capacitor .1 (104Z) 72MHZ and 53MHZ.

Step 19 Change to read:
Install and solder R3 680ohm Resistor (blu, gray, brn, silv.). - 72MHZ; 270ohm (red, purp,brn.) -53MHZ

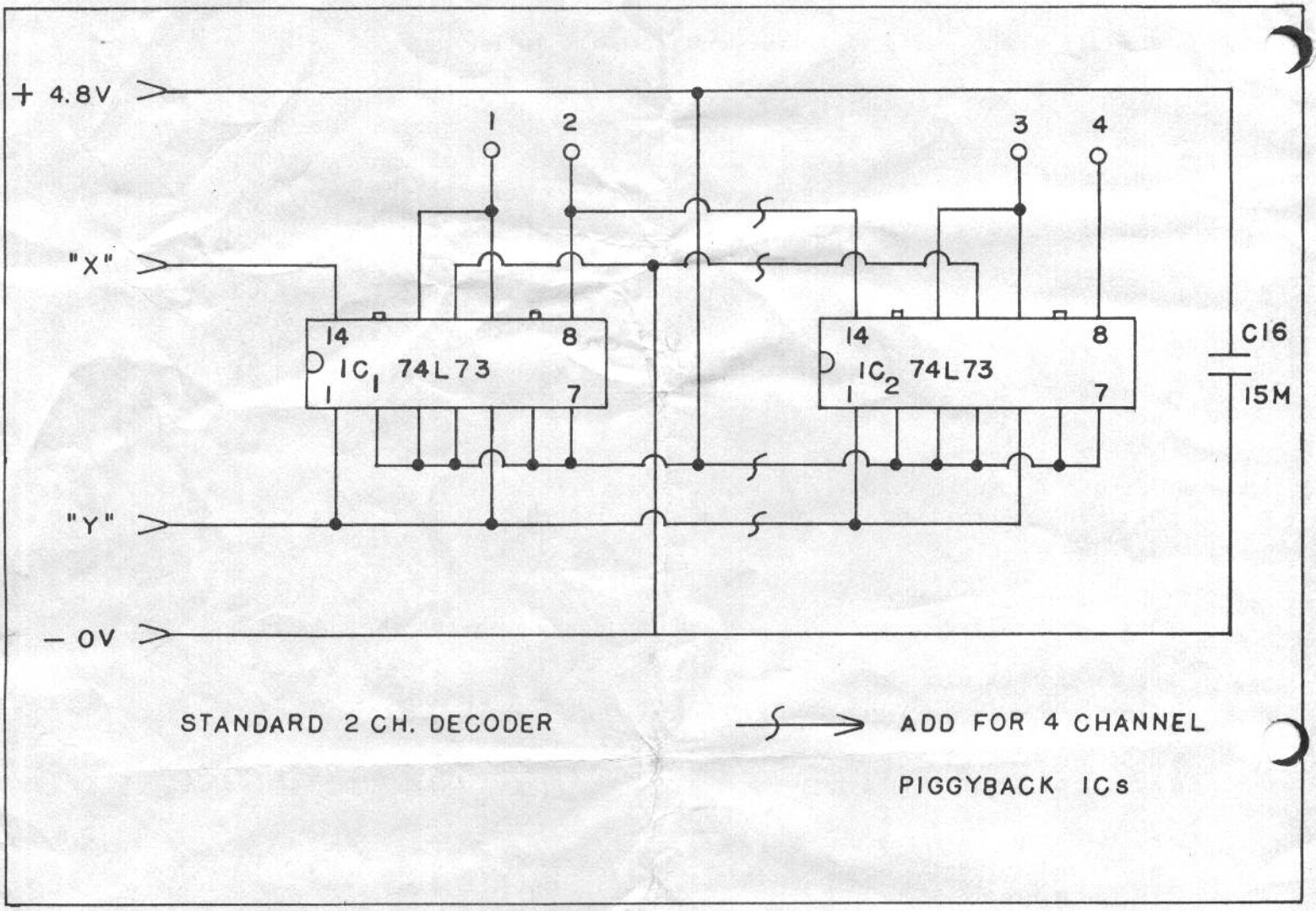
Step 20. Change to read:
Install and solder an 18K resistor, (brn, gray, org.).

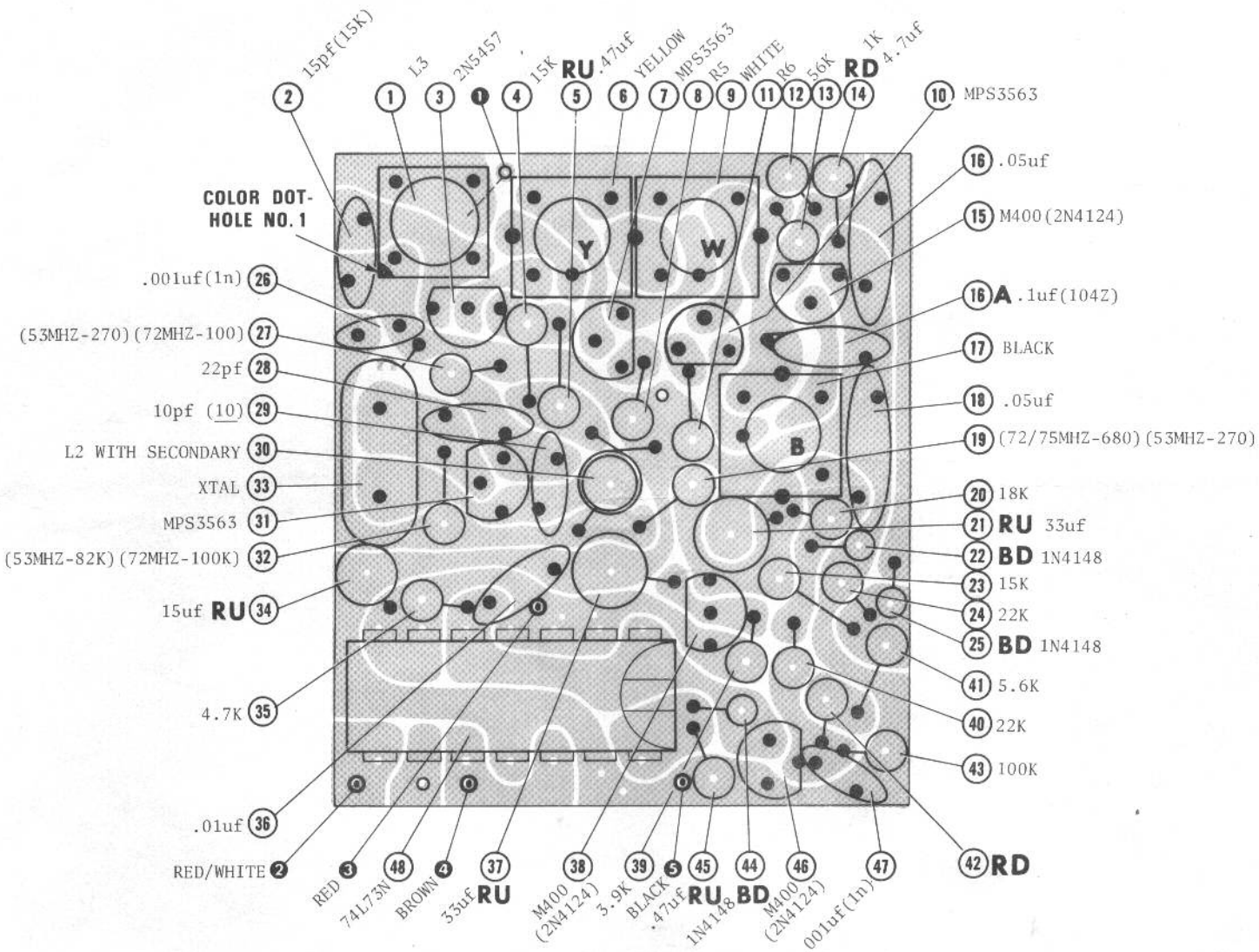
Step 27. Change to read:
Install and solder R2 100ohm resistor (brn, blk, brn, silv.). -72MHZ; 270ohm (red, purp, brn.) -53MHZ.

Step 30. Change to read:
Install and solder the .82uh-72MHZ; 4.7uhy-53MHZ-choke with secondary coil wound around it in position. The rest of this step remains the same.

Step 32. Change to read:
Install and solder R1 100K resistor (brn,blk,yel,silv.).-72MHZ; 82K (gray,red,org.)-53MHZ.

Add Step:
47A. ( ) Before installing IC 74L73N in the PC board, decide whether you wish to have a 2 channel receiver or a 4 channel receiver. If you decide on a four channel receiver, you should at this time piggy back the additional IC 74L73N on top of this one per the conversion instructions on page 8.


+ 4.8V
"X"
"Y"
− 0V
1
2
3
4
14
8
IC1 74L73
1
7
14
8
IC2 74L73
1
7
C16
15M
STANDARD 2 CH. DECODER
ADD FOR 4 CHANNEL
PIGGYBACK ICs



COMPONENT OVERLAY FIG. 3