

TECHNICAL TOPICS

Playmeter 4/77

BY ROBIN L. MINNEAR

Because of good reader response to the Trak 10 modification that appeared in *Play Meter* for January, and because of a growing popularity in games modification, this month's Technical Topics is a discussion of and directions for a *Super Tank* modification.

Tank is probably one of the top five money earning videos of all time. There are still a lot of them on location. I believe that if this modification is done correctly, you can rekindle some of the interest that surrounded Tank when it first hit the market. If you liked Tank, you'll love *Super Tank*.

A Super Tank modification will change your tank in 3 areas. The player will be able to curve and guide the shell around obstacles with existing Tank controls. Each time a tank is hit by the other tank's shell, the playfield will change to another configuration.

Its a wild twist to a successful game concept. There are more player options and strategies.

If you decide to try this modification, you should make it known to the players. Possibly put a sign inside the front glass that says, "Tanks Shoot Guided Missiles." Also give new instructions. Notify the players about the changing playfield. You might, for example, replace the top lightbox sign with a new one that has a vicious looking tank that has fangs.

This modification was performed on a Tank game made by Kee. It has to be done neatly, preferably by an experienced technician.

Shell Modification

There are two aspects of the shell to be modified. One must modify the circuit that deals with the distance that the shell is allowed to travel and to enable the players to guide or curve the shell after it has been fired.

The first thing we want to do is to extend the distance the shell is allowed to travel. *Figure 1* is a drawing of the Tank logic boards. *Figure 2* is a close up view of the part of board two that deals with shell distance.

Devices C8 and C9 are 9602 one-shots. C8 is for the black shell

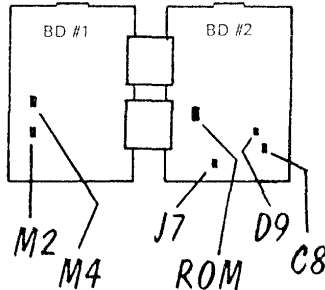


Figure 1: Tank Logics

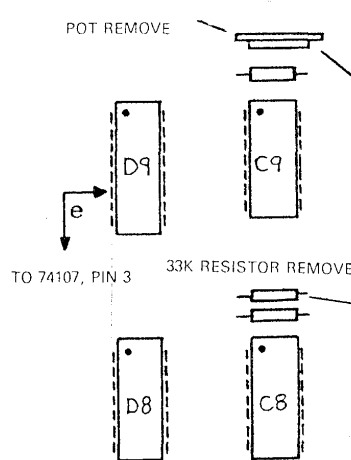


Figure 2: Tank Logic (partial)

and C9 is for the white shell. Just above C8 are two resistors. To modify the black shell distance, remove the 33K resistor (*Figure 2*). To modify the white shell distance, remove the pot that is just above C9 (again as per *Figure 2*).

The 33K resistor and the pot are the timing resistors for the 9602 one-shots C8 and C9. When a shell is fired, the one-shot is triggered. At this moment a timing capacitor begins to charge up through the timing resistors. When the capacitor is charged, the one-shot resets. When the one-shot resets, the shell explodes. By removing the timing resistors the capacitor never charges to reset the one-shot. The shell will not explode unless it hits something.

The second part of the shell modification will allow the players to curve or guide the shell after it has been fired.

Figure 1 shows the location of devices M2 and M4. M2 is part of the white shell motion circuit and M4 is part of the black shell motion circuit.

To be able to curve the shell, all you have to do is cut pins one and two on M2 and M4.

Normally, when you fire a shell, it travels in the direction that the tank is facing. This means that the shell motion circuit receives the tank direction information. After the shell is fired, you can drive the tank away and the shell will continue along disregarding the tank movement. This means the shell motion circuit remembers the tank position at the moment the shell was fired.

By cutting pins one and two on M2 and M4 you are disabling the shell memory. Now the shell will always listen to the tank direction information. To curve the shell just turn the tank.

Playfield Modification

As in the Gran Trak modification (Jan. 77) the tank ROM has two playfield configurations in it. To bring up the other playfield all you have to do is short D9 pin six to ground.

To make the playfield change each time a player shoots the other requires you to add a chip to the logic board. This is done by "piggybacking" a 74107 chip on top of device J7 (*Figure 3*).

The following are instructions for the automatic playfield modification. Again, refer to *Figure 3*.

- 1) Locate device J7 (*Figure 1*).
- 2) Solder a jumper (a) from J7 pin 6 to J7 pin 12.
- 3) Solder a jumper (b) from J7 pin 2 to J7 pin 5.
- 4) Take a new 74107 and bend up all the pins except pins 7 and 14.
- 5) Place the new 74107 directly on J7 and solder pins 7 and 14 of the chips together.
- 6) Solder a jumper (c) from J7 pin 4 to the 74107 pin 12.
- 7) Solder pins 1 and 4 and 14 on the 74107 to each other with a jumper (d).

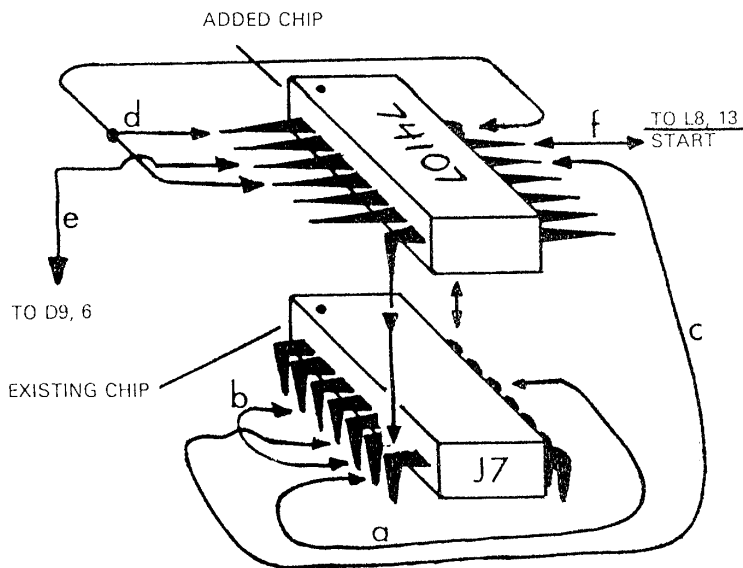
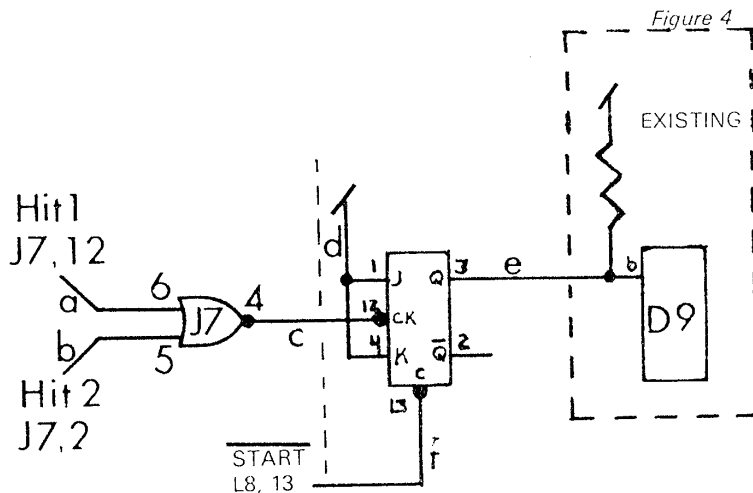


Figure 3



8) Solder a jumper (e) from 74107 pin 3 to D9 pin 6.

9) Solder a jumper (f) from 74107 pin 13 to L8 pin 13.

10) Check for shorted pins or traces. Cut off the unused pins on the 74107. (This is optional.)

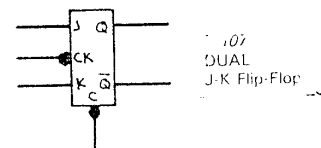
How It Works

Now, refer to Figure 4. J7 pin 12 is a signal that pulses HI each time the white tank has been hit by the black shell. J7 pin 2 is a signal that pulses HI each time the black tank is hit by the white shell. J7 pins 4,5,6 are an unused Nor gate. Pin 4 of J7 pulses LO if pins 5 or 6 pulse HI. So if the white or black tank is hit by a shell, J7 pin 4 pulses LO.

Figure 5 is the symbol and truth table for the 74107 J-K flip-flop. In our application, the J and K inputs are tied HI. According to the truth table, if J and K are HI, the output (Q) changes (LO to HI or HI to LO) when clock (CK) goes from HI to LO.

In Figure 4, J7 pin 4 is tied to the clock input of the J-K flip-flop. So the clock input of the J-K is being pulsed LO each time the white or black tank is hit by a shell. Each time the clock goes LO, the output (Q) changes state.

Pin 3 (Q) of the 74107 is tied to D9 pin 6. If D9 pin 6 is HI, the normal tank field is displayed. If D9 pin 6 is LO, the alternate playfield is dis-



J	K	CK	C	Q
0	0	↓	1	STAYS THE SAME
0	1	↓	1	0
1	0	↓	1	1
1	1	↓	1	CHANGES STATE
X	X	X	0	0

↓ = HI to LO TRANSITION

X = IRRELEVANT

Figure 5

played. D9 pin 6 changes state every time a tank is hit.

L8 pin 13 is labeled start and pulses LO each time a new game starts. L8 pin 13 is tied to the "clear" (C) input of the J-K.

According to the truth table (Figure 5), if "clear" is LO, Q is forced LO. So at the beginning of each game, the playfield is the same. Changing the wire on the 74107 from pin 3 to pin 2 will cause the other playfield to be displayed at the beginning of each game.

COIN MACHINE TRAINING FOR REPAIR MAINTENANCE Trouble Shooting

- SLOTS
- PINBALLS
- ELECTRONIC AMUSEMENTS
- ARCADES
- BINGOS
- VIDEO ELECTRONICS
- MUSIC and VENDING

"Your future is our business."

Nevada Gaming Schools, Inc.

3100 Sirius Road
Las Vegas, Nevada 89102
Tel: 702/873-2345

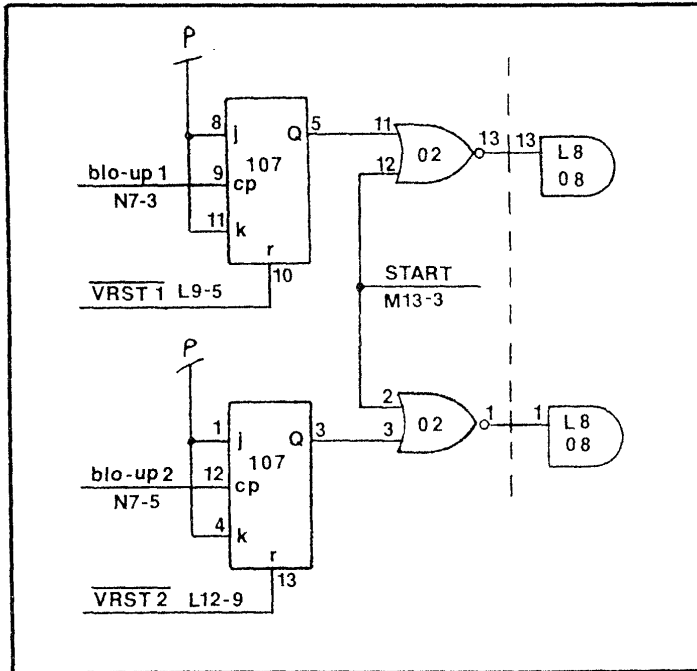


Certified BALLY training school
sixth year

TECHNICAL TOPICS

By Randy Fromm
of the Game Doctors

Supertank modifications



Since the Supertank modification was published in June of this year, operators across the country have been finding new earning power in their games. By performing a few simple changes, weekly collections have been *doubled* for considerable periods of time. In fact, one of our local operators claims that his modified tank has made a minimum of 600 extra dollars over the summer alone! (Those of you that haven't as yet modified your own games, take note!)

Because of Tank's versatile design, a number of different modifications can be performed. This month, we'll take a look at two more modifications that can be used in addition to the Supertank mod. These new modifications can be performed separately or together to help snatch up the quarters that are floating around in the lint ridden pockets of America.

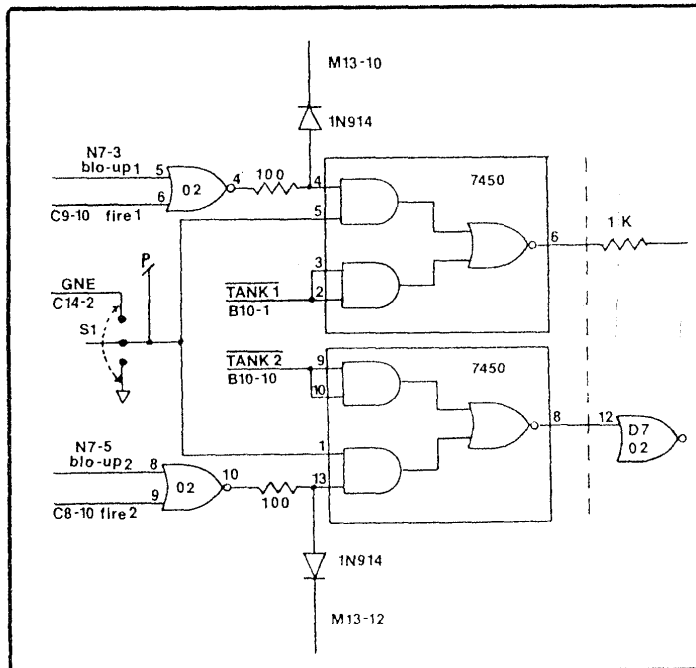
MODIFICATION ONE

As a not-so-good Tanksman (Tanksperson?), it has always frustrated me that my opponent is able to zero in and bombard the heck out of my Tank at close range. As soon as I recover from one explosion I get hit again. I'm forced either to turn tail and run, or face my opponent and exchange hits for the remainder of the game.

This first modification will cause a destroyed tank to disappear after being hit by a shell or running into a mine. A new tank will then appear in the starting position and play resumes as normal. This creates a new strategy for the experienced tank player, as well as giving less equally suited opponents a more enjoyable use of the game.

The circuit itself is quite simple (see Figure One). We'll look at the circuit for Tank 1 only, since the circuit for Tank 2 is identical. When a tank is hit or runs into a mine, blow-up goes high, and initiates the explosion sequence. After a time delay, blow-up goes low and clocks a high out of the Q output of the 74107, J-K flip flop.

This high is nored with the high going start signal so that either a new game or a tank explosion will reset the tank. The output of the nor gate is used, via L-8 (the out of



bounds detector) to reset the flip-flops at L-9.

The outputs of these flip-flops are used to reset the motion counters so the tanks appear in the starting position. When VRST occurs, the 74107 is cleared and Q goes high again.

1. Clip & lift L8-13 (~~underside of the board~~).
2. Clip & lift L8-1 (~~underside of the board~~).
3. Piggyback a 7402 on I.C. L8. Leave pins 7 and 14 down and solder to the corresponding legs on L8.
- 3A. Solder 7402 Pin 1 to lifted pin L8-1.
- 3B. Solder 7402 Pin 13 to lifted pin L8-13.
4. Piggyback A 74107 I.C. on a chip near L8. I used position M8. Put down pins 7 and 14 only.
5. Add wire between 74107 pin 5 and 7402 pin 11.
6. Add wire between 74107 pin 9 and N7-3.
7. Add wire between 74107 pin 10 and L9-5.
8. Add 100 ohm resistor between 7402 pin 4 and 7450 pin 4.
9. Add wire between 74107 pin 12 and N7-5.
10. Add wire between 74107 pin 13 and L12-9.
11. Tie pins 1, 4, 8, and 11 of 74107 to a pull-up resistor (there can be one common resistor for all 4 inputs).
12. Add wire between 7402 pins 2 and 12.
13. Add wire between 7402 pins 2 (or 12) and M13-3 (start).

MODIFICATION TWO

The second modification creates a "Blackout Tank" game. During this mode of operation the tanks are invisible while at rest and are made to appear when firing a shell or exploding. When the tank is in motion, it will flash on and off in proportion to its speed. Switch S1 can be mounted on the game, allowing players to have the option of "Blackout Tank" for the entire game, during the last time period only, or disabled completely. This switch is a single pole, double throw, center-off type.

When I do this modification, I add the 7450 at position B10 and leave pins 7, 10, and 14 down. If you want to cheat a little, you can bend pin 2 of the 7450 so that it can be soldered to pin 1 of B10 (Tank 1). The two nor gates are left over from the first modification (see Figure Two).

1. Cut off pin 2 of B10. (This is the Tank 1 output to the video summing network. We'll be gating the tank

signal and spitting it back out later in the mod!).

2. Clip and lift D7-12.
3. Add wire between 7402, pin 8 and N7-5.
4. Add wire between 7402 pin 9 and C8-10.
5. Add wire between 7402 pin 5 and N7-3.
6. Add wire between 7402 pin 6 and C9-10.
7. Add 100 ohm resistor between 7402 pin 10 and 7450, pin 13.
8. Add 100 OHM resistor between 7402 pin 4 and 7450 pin 4.
9. Add diode between 7450 pin 13 and M13-12 (cathode end of diode to M13-12).

10. Add diode between 7450 pin 4 and M13-10 (cathode end of diode to M13-10).

11. Add wire between 7450 pin 8 and D7-12.
12. Add wire between 7450 pin 6 and pad of B10-2 (I told you we would get around to it!).
13. Add wire between 7450 pins 1 and 5 and pull-up.
14. Add wire between 7450 pin 1 (or 5) and center terminal of switch (common).
15. Add wire between one side of the switch and C14-2 (this is the "game near end" signal).
16. Add wire between the other side of the switch and ground.

STEP 8 - ADD WIRE BETWEEN 74107 PINS
AND 7402 PIN THREE.

Supertank Modification One

The following is the correct step-by-step procedure for Modification One in last month's article on Supertank modifications. Last month's Modification One carried a misprint.

1. Clip and lift L8-13.
2. Clip and lift L8-1.
3. Piggyback a 7402 on I.C. L8. Leave Pins 7 and 14 down and solder to corresponding legs on L8.
4. Solder 7402 Pin 1 to lifted Pin L8-1.
5. Solder 7402 Pin 13 to lifted Pin L8-13.
6. Piggyback a 74107 I.C. on a chip near L8. I used position M8. Leave Pins 7 and 14 down and solder to corresponding legs on M8.
7. Add wire between 74107 Pin 5 and 7402 Pin 11.
8. Add wire between 74107 Pin 9 and N7-3.
9. Add wire between 74107 Pin 10 and L9-5.
10. Add wire between 74107 Pin 3 and 7402 Pin 3.

11. Add wire between 74107 Pin 12 and N7-5.

12. Add wire between 74107 Pin 13 and L12-9.

13. Tie Pins 1, 4, 8, and 11 of 74107 to a pull-up resistor (there can be one common resistor for all four inputs).

14. Add wire between 7402 Pins 2 and 12.

15. Add wire between 7402 Pin 2 (or 12) and M13-3 (start).

Please note that this modification changes the nature of the signal into L8-13, the signal used to clear the track change flip-flop in the Supertank modification of July, 1977. If this later mod is used in conjunction with the first, delete the clear input connection (Step 9) from July's modification, or run the wire to the PAD of L8-13 and not the lifted pin.

— Randy Fromm of the Game Doctors