Tricky Disky

This is a disk made of two layers which can rotate with respect to each other. On the edge there are 4 groups of 4 coloured pieces. Each group is arranged in a circle with two pieces in the top layer, two in the bottom. When the top layer is rotated, the top two pieces of each group are carried along with it to the next group. Each group can be twisted, cyclically permuting its pieces.

The pieces come in 8 colours, so there are two pieces of each. The pieces are also marked with either a little triangle or a circle, so that all of the 16 are unique. The puzzle can be solved completely, with all 16 pieces in their correct positions, or you could solve the colours only and ignore the triangle and circle markings.

The puzzle was patented by Universal Connections Steckverbindungen Vertriebs GmbH, 28 December 1989, DE 3,821,297. The name of the inventor is not listed. The Tricky Disky has also been sold under several other names (such as Mind Trapper, and Tricky Disk), due to a trademark dispute.

The original version of the puzzle was Hungarian, and called the Ufo or Varia-Disk. That had a slightly different colour scheme, and pieces marked with one or two dots. It turns much more smoothly than the Tricky Disky. I was invented by Imre Peredy, patented 31 March 1983, WO 83/01009.

There is also a version which has only 3 groups of 4 coloured pieces, all without markings. This seems to be a cheap imitation of the Tricky Disky puzzle, made by some manufacturer in the far East. Its official name is the generic sounding "Magic Ufo Puzzle", but I tend to call it "Triple Disky".

The number of positions:

There are 16 pieces, giving a maximum of 16! positions. All these positions are attainable, so there are 16! = 20,922,789,888,000 positions, assuming that the relative position of the two layers is not considered important. If the markings are ignored, then there are $16!/2^8$ = 81,729,648,000 positions.

The Triple Disky, which has 12 pieces and no markings, has $12!/2^6$ = 7,484,400 positions. I have done a computer analysis of the Triple Disky in order to find God's Algorithm. The results are in the tables below. Analogous to the Rubik's cube, there are two ways to count the moves. The Face Turn Metric means that a turn of any group of 4 pieces by any amount is a single move. The "Quarter" Turn Metric means that only 90 degree turns are single moves. In either case, a turn of the top layer is also a single move. The table shows that the puzzle can always be solved in no more than 13 moves, or 15 quarter turns.

Face turn metric

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
0	1														1
1		6													6
2		3	24												27
3			18	104											122
4			3	108	412										523
5				30	562	1596									2188
6				1	255	2634	6167								9057
7					38	1499	11998	22795							36330
8						342	7851	51128	80438						139759
9						30	2118	36908	201130	250357					490543
10							230	10756	148423	686502	579125				1425036
11							10	1110	36237	469160	1598487	629520			2734524
12								20	2451	74600	764251	1281186	103914		2226422
13								2	8	1560	46368	259276	103473	329	411016
14											135	3171	5343	159	8808
15													25	13	38
Total	1	9	45	243	1267	6101	28374	122719	468687	1482179	2988366	2173153	212755	501	7484400

(Rows labelled down the left side: **Q u a r t e r   t u r n   m e t r i c**)

Links to other pages:

Tricky Disky official homepage A silly intro, but not much real content.

Notation:

F : Clockwise quarter twist of the group at the front.
F' : Anti-clockwise quarter twist of the front group.
F2 : Half twist of the front group.
B B' B2 : As above, but pertaining to the back group, the group opposite the front.
T T' T2 : Turns of the top layer.

Solution to the Tricky Disky (and Varia-Disk):

Phase 1: Solve 3 pairs of pieces in the top half.

a. Find the piece that is to go the front group at the top right.
b. If it is in the bottom layer, then turn the bottom to get it to the front group.
c. If it is in the top layer, then turn the top to get it to the front group, do F2 and turn the top layer back again to where it was before.
d. Twist the front to put the piece at the top LEFT of the front group.
e. Find the piece that is to go the front group at the top left.
f. If it is at the front, top right, then swap the two pieces with the sequence FTF'T' F TFT'F2.
g. If it is elsewhere in the top layer, then turn the top to get it to the front group, twist the front to put the piece at the bottom left, turn the top back and then finally do F to put the pieces correct.
h. If it is in the bottom layer, then turn the bottom to get it to the front group. If it is now at the bottom right of the front group then do TFT'F, but if it is at the bottom left then simply do F.
i. The top front pair is now correct. Do T, and then repeat all the above twice more.

Phase 2: Solve 3 pairs in the bottom half.

a. Turn over the disk so that the solved pairs are at the bottom, on the left, right and back.
b. Use the same method as phase 1 to solve 3 pairs from the top half. When finished, everything but the front group is solved.

Phase 3: Solve the final group.

a. Rotate the front group, so that at most only two pieces need to be swapped.
b. If you need to swap the top two pieces, then do the following moves: F T2 F B' T2 F T2 F' T2 B T2 F' T2
c. If you need to swap the bottom two pieces, just turn the disk over and do the above sequence.
d. If you need to swap two other adjacent pieces, then turn the front to bring them to the top layer, do the sequence above, and turn the front back again to put the group into its correct position.
e. If you need to swap two pieces diagonally, do a quarter turn of the front pieces such that you get a position where both the top pair and bottom pair should be swapped. Then do this sequence: T2 F B T2 B T2 F B T2 B T2 F B T2. Then turn the front so as to put the pieces correct.

Solution to the Triple Disky:
The same notation can be used (but without the letter B).

Phase 1: Solve 2 pairs of pieces in the top half.
Use the same method as phase 1 for the normal disky.

Phase 2: Solve 2 pairs in the bottom half.
Use the same method as phase 2 for the normal disky.

Phase 3: Solve the final group of pieces.

a. Hold the puzzle so that the final unsolved group is at the front.
b. Rotate the front group, so that at most only two pieces need to be swapped.
c. If you need to swap the top two pieces, then do the following moves: T F T F2 T' F' T F T F T' F'
d. If you need to swap the bottom two pieces, just turn the disk over and do the above sequence c.
e. If you need to swap the two pieces on the right side of the front group then do T' F T F2 T' F'. Note that this is a shorter way than with the normal tricky disky, since it takes advantage of the fact that there are identical pieces.
f. If you need to swap the left two pieces, just turn the disk over and do the above sequence e.
g. If you need to swap two pieces diagonally, do a quarter turn such that you get a position where both the top pair and bottom pair should be swapped. Then do this sequence: T F' T F' T F' T F T F

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