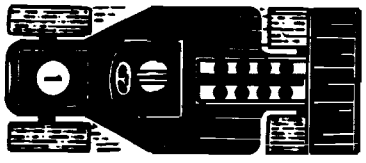
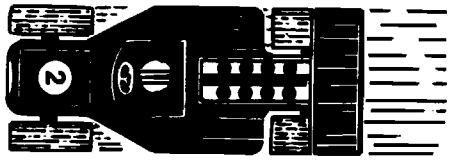
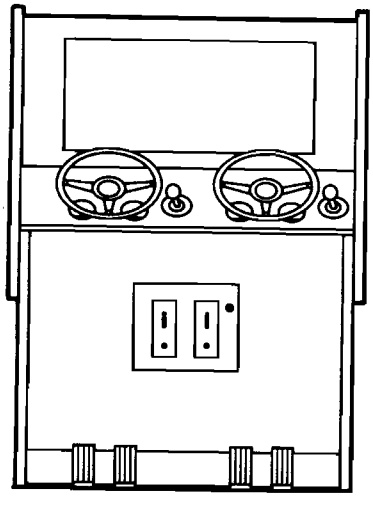
TWIN RACER

TM-021







Another NEW KEE GAME feature.

AN OIL SLICK ON THE TRACK!

OPERATION AND SERVICE MANUAL

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Los Gatos, CA 95030
Telephone (408) 374-2440
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INTRODUCTION AND WARRANTY INFORMATION

Twin Racer is a coin operated video amusement game giving the players the feel and the performance of a high speed formula car race. Greatly enhancing the dimensions of the game are the almost life-like sounds of acceleration, shifting, braking, and crashing, as the cars are driven around the course.

The electronic circuits of this game are solid state for long life and low maintenance. Pedals, steering and shifting assemblies have been designed modularly for easy removal and servicing.

As with all extremely sophisticated race cars, Twin Racer is subject to minor breakdowns. The printed circuit boards (PCB) are covered with a one year warranty. The Motorola TV Monitor is also covered under warranty for a period of thirty days. The warranty commences on the date of shipment.

If either the P. C. boards or the TV fail after their specified warranty period, KEE GAMES will repair the item for a nominal parts and labor charge. The TV monitor, after the warranty period, may be taken to a competent TV repair shop.

If any questions arise concerning the warranty repair or replacement, contact your distributor or KEE GAMES at (408) 249-6090 and ask for Mike Sieler or Gary Kinney in Distributor Services.

BASIC CONSTRUCTION AND ACCESS

There are two openings through which to gain access to the inside sub-assemblies: the coin mech door and the rear door. Each of these openings provide easy and convenient access to all necessary points. The coin mech door provides access to all of the coin handling equipment and the foot pedal mounting bolts. The rear door gives access to the PCB computer, rear of the TV monitor, the steering, shifting, starter switch, and automatic shift components.

All of the major sub-assemblies have been designed for easy servicing and replacement. All assemblies can be removed easily after the retaining bolts and wiring have been removed.

RECEIVING INSPECTION PROCEDURES

Immediately upon receiving the Twin Racer game, uncrate the game and inspect the outside area for any damage that may have occurred during shipping.

Each and every new Twin Racer that leaves the factory is carefully checked and properly adjusted for maximum performance. However, since vibration and environmental changes can alter some of the adjustments, the following is a list of steps to follow in your inspection of the game:

1) With the machine unplugged, open both doors, front and rear, and give the insides of the game a good eye inspection. Look for wires that may have been loosened or for screws, bolts and nuts that may need tightening. Check the individual sub-assemblies for proper function (i. e., steering, shifter, etc.), making certain at the same time that each item is mounted securely. Be watchful for any foreign matter that may short electrical connections. Check for tightness of all plugs and sockets. The power cord can be found outside the rear of the cabinet.

2) Plug in the power cord using the appropriate voltage (indicated on the serial number sticker on the rear of the game cabinet. After a few moments, of warm-up the CRT (cathode-ray tube) should display the race track, scores, and race cars. The picture should be sharp and clear exhibiting the proper levels of brightness and contrast. The background should be black and game details should be light and distinctive.

3) Check the coin mech operation with several old and new coins. No genuine coin should be rejected. Pressing the starter switch, located on the center of the front panel, should start the game by resetting the score to 0 and the car's engine beginning to idle with a wild hot-cam effect. Inside the start switch is an LED (light-emitting diode) which should light up indicating credit of play. After starting the game, check the function of the pedals and the steering and shifter. The automatic shift button places the shifter into third gear and enables a new player to get acquainted with the game without having to worry about shifting.

4) The playtime is preset at the factory for approximately a minute and should not be changed.

5) Check the doors to see if the locks bind in the "locked" or "unlocked" position.

GAME SEQUENCE

With the game plugged in and the rear door closed, the CRT will display the attract mode. The attract mode displays the race track and the cars in a stationary position where the last players left off, plus the scores of the last game.

Depositing a quarter in the coin slot lights the credit light on the starter switch indicating a game credit. Depressing the starter button resets the score to zero (0), the cars return to the starting grid with engines idling.

The controls of the game, movements and sounds of the cars simulate that of real-live racing formula cars. The players have the option of a manual or automatic transmission. When the gas pedal is depressed the car begins to move. If the manual transmission is chosen, the player shifts up to the next higher gear when the revs reach their peak until hitting the peak rpm in third gear. The shifter is a standard three on the tree pattern with reverse included.

The steering wheel causes the car to turn in the direction of the rotation, but it is not necessary to bring the steering wheel back to its center position.

Stepping on the brake pedal will bring the car to a skidding halt with a realistic sound accompanying it. If the steering wheel is turned with the brakes on, the car will still head in the direction of the skid, reacting

like that of a real-live panic situation.

The points for the score on the CRT are made each time the car passes over hidden score positions, if and only if, the correct pattern around the course is followed. A total of ten points is obtainable for each lap completed.

SERVICE PROCEDURES

UPPER SECTION SUB-ASSEMBLIES

The following procedures are steps that are to be taken in order to service the illumination lamps, the plexiglass, the bezel, the lap timer and to repair the TV Monitor.

1) Plexiglass Removal: To remove the plexiglass, open the rear door and reach up inside the cabinet and remove the three nuts used to secure the aluminum bracket. With this bracket removed, carefully slide the plexiglass up and out. To reassemble, follow the reverse of this procedure.

2) Illumination Lamps: There are 11 6-volt #GE47 lamps mounted on an aluminum support plate directly behind the upper portion of the plex. If these need replacing, follow step #1 to remove the plexiglass. With the plexiglass removed the lamps can be taken out by pushing on the bulb then turning it to the left and pulling the bulb out. To reassemble, follow the reverse of this procedure.

3) T. V. Monitor Removal: To remove the entire Motorola TV, unplug the socket on the rear of the monitor and unplug the molex socket going to the illumination lights. Do not remove the Monitor from the shelf. With all the mounting screws removed the TV can be slid out from the front of the game. To reassemble, follow the reverse of these steps. Feed these wires through the hole in the T.V. mounting board and slide the T.V. and its mounting board out.

MOTOROLA TV ADJUSTMENT

The adjustment of the Motorola TV monitor functions like that of a normal TV set. The only exception to that is that the audio portion of the TV is not used. The volume control is located on the analog PCB computer. The monitor is adjusted through the rear door.

1) Brightness: Adjust the brightness before the contrast. Adjust so that the CRT background is as dark as possible.

2) Contrast: The contrast is adjusted so that the images displayed on the CRT are as bright and clear as possible without being blurred.

3) Vertical Hold: The vertical hold should only be adjusted if the picture is rolling up or down the screen. Adjust for a stable centered picture.

4) Horizontal Hold: If the picture is slightly off-center horizontally, or if the images appear warped, or if the picture is broken into a series of diagonal lines, adjust the H Hold.

5) Vertical Size: Adjust only if the top and bottom of the race course is cut off from the visible portion of the screen or there is too much distance between the edge of the course and the edge of the screen which will appear as an extra set of horizontal dotted lines on the top and bottom of the CRT display. Adjust for maximum picture size.

6) Vertical Linearity: Change this adjustment only if the top of the picture seems compressed.

7) The Yoke: The yoke should never need adjustment unless the adjuster has been tampered or damaged. If yoke adjustment is necessary, rotate both yoke rings simultaneously for optimum centering of race course on the CRT.

MAINTENANCE AND TROUBLESHOOTING PROCEDURES

Twin Racer, due to its solid state circuitry, will require very little maintenance other than periodic cleaning, lubricating and TV adjusting.

The cabinet and plexiglass screen may be cleaned with any non-abrasive household cleaner. The coin acceptors and the lock cylinders should be lightly sprayed with WD-40 or a similar silicone lubricant, once every three months. The TV monitor is adjusted only if the picture is incorrect.

In troubleshooting the Twin Racer amusement game, the first real step is to correctly identify the problem with the observable symptoms of the malfunction. Examine the game carefully for a correct diagnosis.

1) The TV Monitor: Many TV problems can be corrected simply by proper adjustment. But if the problem persists, or if the TV is undoubtedly malfunctioning, contact your distributor or remove the TV monitor and take it to a competent local TV repair shop. Complete TV monitor repair manuals are available from the KEE GAMES Customer Service Department, 330 Mathew St., Santa Clara, Ca. 95050. Phone (408) 249-6090 or Telex: 357441

2) The PC Board Computer: Most PCB malfunctions will not be within your scope to repair. If you can positively determine that the PCB has failed, contact the distributor from whom the game was obtained for repair or replacement instructions. Some problems that might appear

as PCB problems could possibly be the result of improper TV adjustment or the various small blue trim pots located upon the PCB are out of adjustment. DO NOT ATTEMPT TO REPAIR THE PCB YOURSELF UNLESS YOU HAVE BEEN SPECIFICALLY INSTRUCTED TO DO SO BY YOUR DISTRIBUTOR. To do otherwise will void the PCB warranty.

3) The Wiring Harness: For troubleshooting purposes, the harness includes the line cord, fuse, line filter, transformers, the start coin and automatic shift switches, steering assembly, gear shift, pedals, PCB edge connector, TV monitor, speaker, lap timer, illumination lamps and all of the interconnecting lengths of wire.

4) Suggestions: The follwoing are some specific instructions and suggestions for troubleshooting the Twin Racer game. To perform even the most simple troubleshooting procedures, there must be available a VOM (Volt Ohmeter) and, if possible a VTVM (Vacuum Tube Volt Meter) or digital Voltmeter. It is also helpful to have another Twin Racer game on hand for substitution purposes.

For many problems, substitution may be the easiest way to troubleshoot the game. For example, if a PCB malfunction is suspected, substitute a known-to-be-good PCB. If the problem disappears, then the first PCB is the troublemaker. But, on the other hand, if the problem still persists, then the malfunction must be in either the harness or the TV monitor. Conversely, the same goes for the TV monitor concerning substitution.

The harness must be checked by elimininination. Substitute a known-to-be good TV and PCB, and if the malfunction persists, the harness and associated mechanical or electronic equipment must be at fault. The harness can also be checked with an Ohmeter and a continuity checker.

5) T. V. Monitor Troubleshooting: Some typical TV problems are distorted display, raster only, or no video at all. If you do not have a raster (a raster is a lighted but blank TV screen with the brightness turned all the way up), begin checking the power supply to determine if the TV is getting power. If the general illumination lamps of the machine are lighted, at least you know that power is reaching the machine. If not, check your line cord, interlock switch, fuse, etc. If it is A. C. power, go around to the back of the machine and with the rear door open (and interlock switch defeated) listen for a hum emanating from the monitor. If there is a hum, the monitor is powered and you may have a defective CRT or similar problem. Another test (and one which can be performed in a noisy environment) is to measure the voltage between the TV fuses and ground. If your voltmeter reads 110 volts or more, you know the monitor is powered. If not, check the fuses, the TV connections and the harness to see why power is not reaching the monitor. If the TV is powered but still not functioning, check the TV AC voltage switch which should be set to the "115" position ("115" visible on the switch) if it is connected to a 110 volt line source. If you have the correct voltage after the fuses, but the monitor still will not function, you have two choices: (1) Remove the monitor and take it to a specialist, or 2) Turn to the TV schematic

and start exploring the monitor with a VTVM and an oscilloscope. If you do have a raster, you must determine why there are no video signals being displayed on the screen. These video signals are generated by the PCB computer and enter the monitor through pin (#1) of the TV monitor connector.

6) Steering Assembly Troubleshooting: Four small red LEDs have been included on the main PCB near position H8 to aid in troubleshooting the steering electronics.

Mounted on the small steering assembly PCB are two phototransistors and two infrared light emitting diodes. The phototransistors are mounted behind the tack ring in such a way that the slots in the wheel break up the light emitted from the diodes. This generates pulses which are used by the computer to determine how quickly and in which direction the wheel is being turned.

The test LEDs on the analog PCB will light whenever the infrared diodes are stimulating the phototransistors (i. e., whenever the diodes are "shining" through the slots in the slotted wheel onto the transistors). To test the steering wheel assembly, simply rotate the wheel slowly in both directions while watching the two red LEDS on the main PCB. If your steering assembly is O.K., both LEDs will flicker. If both of the LEDs fail to light (or remain lit constantly) while wheel is being turned, you definitely have a malfunction before the main PCB, which may be either in the wiring harness or in the steering assembly PCB.

7) Troubleshooting By Symptom:

a) No Power: Check for correct line voltage and if O.K. then

check the fuse on the electronics tray, interlock switch and the transformer primaries.

b) No TV Picture: Check for power as per procedure #a (NO POWER) and if O.K., check TV connector and TV fuses. Measure voltage at TV fuses (should be 110 VAC) and if O.K., replace the TV monitor. Check C-29 (.56 uf) and Horizontal Output Transistor.

c) TV Raster Only: Check the harness and especially the PCB edge connector. If O.K., check the TV as per the special test under "TV Troubleshooting". Or check TV or PCB by substitution.

d) TV Picture Rolls: Adjust the TV vertical hold and if the rolling persists, check the TV or the PCB by substitution.

e) TV Picture is Wavy: Adjust the TV horizontal hold and if the problem persists, try replacing the transformer (in the monitor itself).

f) TV Picture is Broken into Diagonal Lines: Adjust the TV horizontal hold and if the problem persists, check the TV or the PCB by substitution.

g) No Game Credit: Check the coin switches, the start switch, the harness and the positions of the PCB slide switches. If the problem persists check antenna wire and try substituting a new PCB.

h) No Game Start: Check the coin switches, the start switch, the harness and replace the PCB if necessary.

i) Game Credit Shuts Off or Picture Shrinks: Check the line

voltage with your VOM and be aware that a large motor starting up (i. e., an air conditioner) may drop the line voltage. Check to see that machine is firmly plugged in. If the problem only occurs at certain times of the day your trunk line voltage may be dropping.

j) No Audio: Check the volume controls, speaker connections, and for 20 volts. If the problem persists, test the speaker and if the speaker is O.K., try replacing the PCB.

k) Game Sequence Incorrect, Parts of the Race Course, Car, Score Missing or Distorted: Replace the PCB or check for proper power supply as described in "Troubleshooting the Power Supply."

l) Car Will Not Steer or Turns in One Direction Only: Check PCB LEDs as per procedure #6 and if O.K., then replace the PCB computer. If LED test is O.K., check steering harness and connections and for foreign matter in steering assembly. Replace steering PCB if necessary.

m) No Brakes: Check brake switch and wires from brake pedal switch to PCB. If O.K., check the PCB.

n) Brakes All the Time: Check brake switch for foreign material and/or shorting terminals.

o) No Accelerator: Follow procedure #m for "NO BRAKES".

p) Accelerator all the Time: Follow procedure #n.

q) All Four Gears Dead: Check connections and wires from gearshifter to PCB, check automatic shift switch.

r) One, Two or Three Gears Dead: Check the connection and harness of the malfunctioning gear (s): check the shift switch(s) for the malfunctioning gear(s). If problem persists, replace PCB.

s) No Automatic Shift: Check the wires on the switch. If all are correct, check the switch itself.

t) No Lamp Lit on Automatic Shift Switch: Check power and replace if lamp burned out.

SERVICE PROCEDURES

ELECTRONICS TRAY SUB ASSEMBLIES

(Power must be turned off when replacing parts).

1) Fuse Replacement: If the fuse is blown replace with, and only with, a 1 Amp, 125 volts Slo-Blo fuse (313-3AG). When replacing the fuse be certain the game is in proper working order, as the fuse would only blow if something was malfunctioning.
2) Transformer Replacement: To replace a defective transformer, note down on paper the color and position of each wire, and remove the wiring. There are two screws that mount the transformer to the cabinet. Remove these. When replacing, make certain to reconnect all wires in their proper place.
3) Printed Circuit Computer Board: To remove the PCB computer, disconnect the edge connector and remove the retaining screws carefully. Remove the board. The PCB is very delicate and fragile and requires extreme care in handling and shipping.
4) P.C. Board Adjustments:
    a) Volume: This adjustment is made by the small blue trim pots marked "volume" located on the analog board, on the left side of the cabinet. Adjust the volume according to the locations need but remember that the volume will sound louder with the door off.

b) Playtime: This adjustment is located near H-9. The play time trim pot adjusts the length of the game and also the crash time. The playtime pot is preset at the factory for 1 minute and should not be adjusted due to its interrelations with other game functions.

c) Special Adjustments: If the following symptoms occur, the board must be returned to the distributor from whom you obtained the game.

1) The car seems to move too slowly.

2) The sound of the engine is distorted.

3) The sound of the skid with brakes applied is wrong.

SERVICE PROCEDURES

FRONT CONTROL PANEL

To service the rear side of the control panel, open the rear door to the cabinet.

1) Gear Shift Assembly: Record the wire colors and position and remove. The shift assembly can be removed after undoing the four mounting screws.

   To open the gear shift assembly, remove the four screws on the securing tubs, while holding the two halves together. Carefully split the housing halves so that the internal parts will not spring away and become lost. With the housing halves separated, the gear shift rod, spring, ball, detent and switch actuators will all be accessible. When reassembling the gear shift unit, lubricate all of the surfaces exposed to wear with a small amount of silicone grease. make sure that the housing screws are replaced in the exact same way as removed.

2) Pedal Assembly: The pedal assembly must be removed from the game in order to replace the brake and accelerator switches. To remove the pedal sub-assembly, reach in the front door and remove the three mounting nuts. From the front of the pedals, pull the assembly out from the game towards you and lift up. Unlocking the wires, making note of wire color and position, frees the pedal assembly from the cabinet.

3) Steering Wheel: To remove the steering wheel, remove the shaft end nut and pull the steering wheel out from the front. Undo the three socket head bolts and the long bolt to completely divorce the wheel from the rest of the assembly. To replace the steering PCB, remove the shaft end nut and tack ring. The board can be replaced after removing the two mounting screws.

   To replace the steering wheel bushing assembly, remove the steering wheel and also the six retaining screws which hold the backing plate to the control panel. Withdraw the bushing assembly through the front of the panel.

   When reassembling, lightly lubricate the bearing surfaces with a small amount of silicone grease.

4) Starter Button: Note the position and color of each wire and unplug from the switch. Then unscrew the switch from the barrel assembly.

5) Automatic Shift Button: To remove this switch, record the color and position of the wires and remove. Push the four mounting and securing tabs against the switch and push the switch out to remove.

ANALOG-EDGE CONN (44 PIN)

	GND	1	G/BLK
	AC	2	BLU
	AC	3	BLK
	COIN-COUNTER	4	BRN
	BRAKE-B	5	O
	GAS-B	6	Y
BLU		7	
	1-GEAR B	8	V
	R-GEAR B	9	GY
	2-GEAR B	10	W
	BRAKE-B	11	BLK
	3-GEAR B	12	W/BRN
	GAS-B	13	W/BRN
W/Y		14	
W/BLU		15	
	2-GEAR A	16	W/V
	R-GEAR A	17	W/GY
	1-GEAR A	18	W/BLK
	BRAKE-A	19	BLK/W
	3-GEAR A	20	BRN/W
	GAS-A	21	O/W
	GND	22	G/W
	GND	A	G/R
BLU/W		B	
V/W		C	
	COIN-COUNTER	D	GY/W
BLK/Y		E	
BN/Y		F	
	+5V	H	R
	+5V	J	R/W
	+5V	K	R/BLK
	GAS-A	L	O/Y
	STEERING-B	M	BLU/Y
	STEERING-B	N	V/Y
GY/Y		P	
	BRAKE-A	R	BN/BLK
	AUDIO-B	S	O/BLK
	AUDIO-A	T	Y/BLK
	STEERING A	U	BLU/BLK
	STEERING A	V	V/BLK
GY/BLK		W	
O/R		X	
Y/R		Y	
	GND	Z	G/Y

110V AC 60HZ → POWER, FUSE

STEERING BD A

STEERING BD B

LAMPS-N → 6V, DISPLAY BD-TO TV

GEAR SHIFT-A (1, 3, R, 2) — AUTO GEAR SHIFT A

GEAR SHIFT-B (1, 3, R, 2) — AUTO GEAR SHIFT B

GAS BRAKE A

GAS BRAKE B

START 2 PLAYER (NO, NO) 18A WG

5-WATT LOUD-SPEAKERS A, B

TV (1 3 5 7 9 / 2 4 6 8 10) — GND, AC, 6V TO DISPLAY-BOARD

COIN-COUTER

COIN-MECH'S (1, 2) NO, C, NC — GREEN, GREEN

TERMI-OUT ANALOG BD

COIN SWITCH-N.C.	2	1	RATE B
C W A		3	SCREECH B & CRASH B
SKID B	6		SCREECH B
SCREECH A & CRASH A		7	RATE A
SPEED PULSE B	10		C W B
SKID A		11	SCREECH A
CRASH B	14		CRASH B
SPEED KILL B		15	SPEED PULSE A
REVERSE B	18		REVERSE A
		19	SPEED KILL A
CRASH A	22		CRASH A
		23	
-12V	26		ATTRACT
-5V		27	Y
+5V	30		+5V
GND		31	GND
GND	34		GND

FUSE, FAN

110V AC 60 HZ → 10V AC

DIGITAL-EDGE-CONN (22 PIN) G/G

	1	GND	
R-TP	2	AC	
BLK-TP	3	AC	
BN	4	START-2	
G	5	LED-CREDIT-2	
Y	6	START-1	
BLU	7	LED-CREDIT-1	
V	8	VIDEO	
GY	9	COIN-MECH-NO	
W	10	COIN MECH-NC	
	11		W/BLK
	12		W/BN
	13		W/R
	14		W/BN
	15		W/Y
	16		W/G
	17		W/BLU
	18		W/V
	19	TEST OUT	W/GY
	20		BLK/W
	21		BN/W
G/BLU	22	GND	

K4DRTA-HARNESS. ELECTRIC-DWG

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