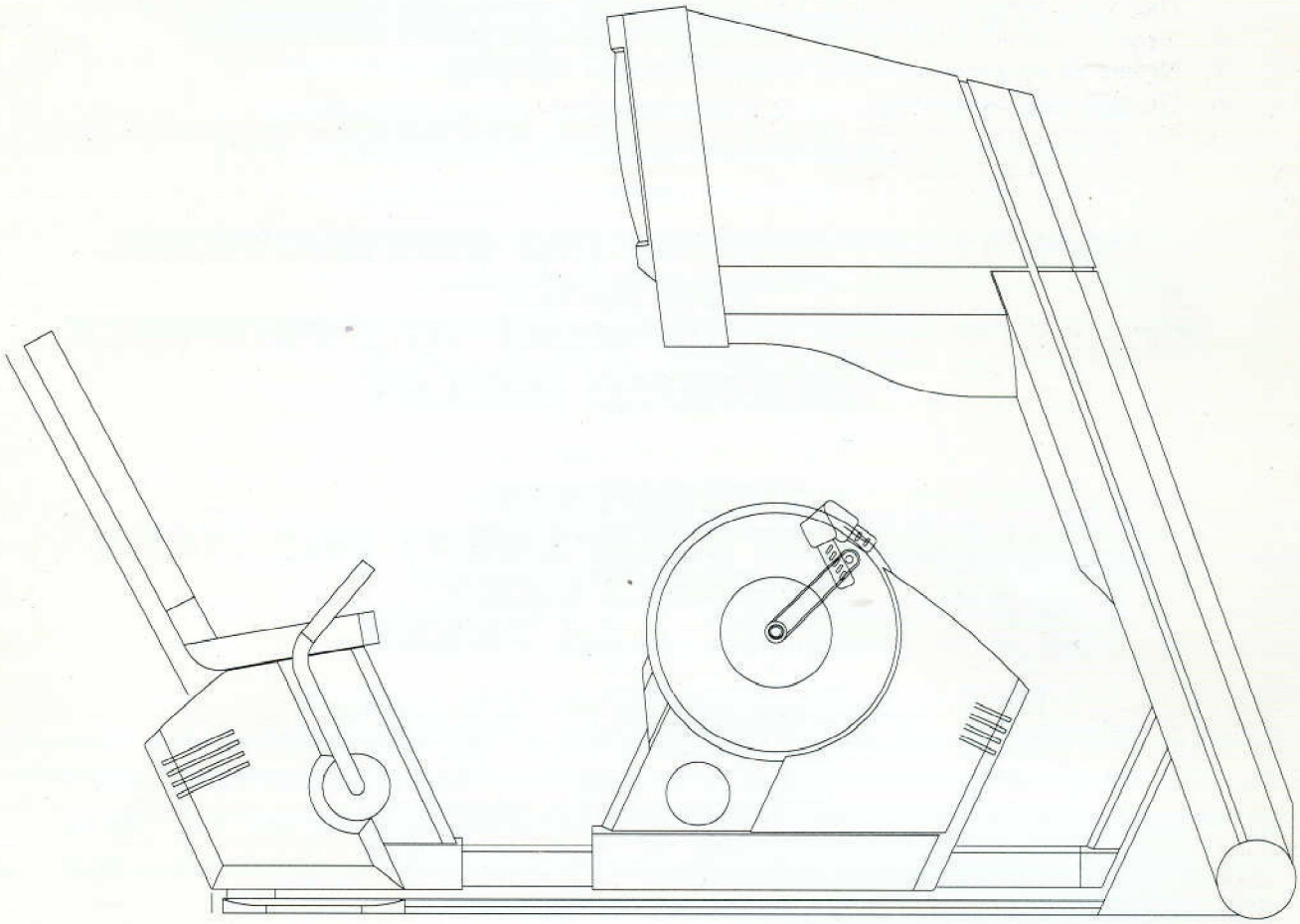
VR Bike

MADE IN U.S.A.

MAINTENANCE AND REPAIR



Tectrix

TECTRIX FITNESS EQUIPMENT

68 FAIRBANKS
IRVINE, CA 92618
(800) 767-8082
(714) 380-8082

SAVE THESE IMPORTANT SAFETY INSTRUCTIONS

1. Read all instructions before using this equipment.
2. DANGER: DISCONNECT FROM SUPPLY CIRCUIT BEFORE OPENING. *AVERTISSEMENT: DECONNECTER DU CIRCUIT D' ALIMENTATION AVANT D' OURVRIR.*
3. Unplug all electrical appliances before cleaning and after use.
4. Close supervision is necessary when this equipment is used by, or near children, or disabled persons.
5. Use this equipment only for the intended use as described in this manual.
6. Never operate equipment that has a damaged power cord or plug.
7. Never drop or insert any object into any opening.
8. Do not use outdoors.
9. To disconnect, switch off power switch (on the front of the equipment), then remove plug from outlet.

IMPORTANT GROUNDING INSTRUCTIONS
WARNING:
CONNECT THIS EQUIPMENT TO A PROPERLY GROUNDED OUTLET

ATTENTION -
BRANCHER CET EQUIPEMENT UNE PRISE CORRECTEMENT
RELIÉE À LA TERRE

This equipment is for use on a nominal 120-volt circuit and has a grounding plug that looks like the outlet illustrated in 'FIGURE A' below. This equipment *must* be grounded. No adapter should be used. It has been supplied with a cord having an equipment grounding conductor and plug. This plug must be plugged *only* into a properly installed grounded outlet. Failure to do so can result in the risk of electrical shock. Do not modify the plug provided with this product — if it does not fit, have a qualified electrician install the proper style outlet.

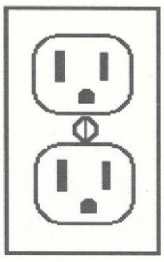
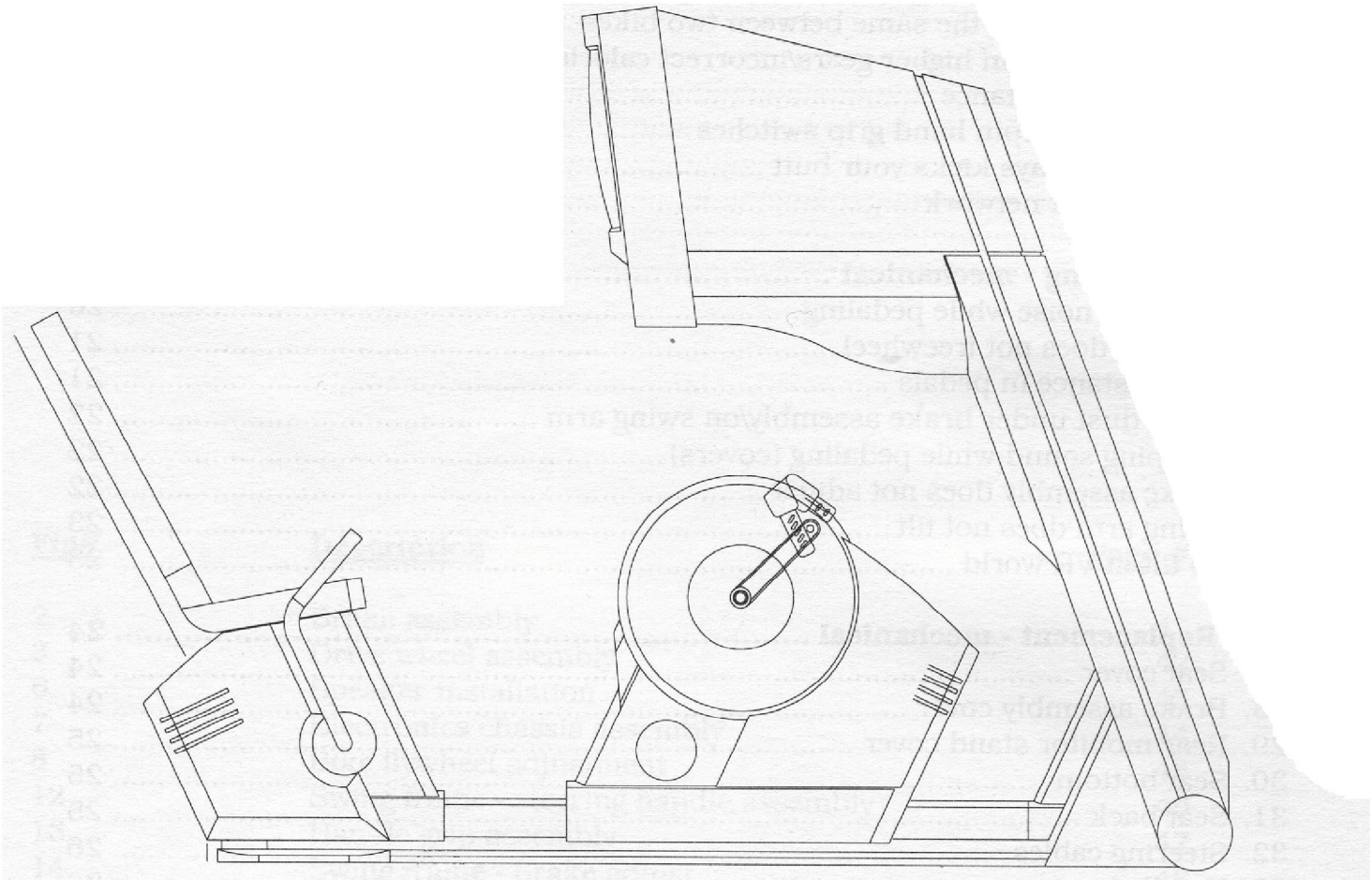


FIGURE A - Grounded Outlet

VRBike

MADE IN U.S.A.

EVERYONE SHOULD BE THIS WELL BUILT



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Overview

The VR Bike's computer hardware is currently a conventional 486/66MHz personal computer, augmented with an off-the-shelf sound card. The video display is a 20-inch TV-style monitor, which gets its video signal from a conventional VGA card. The system boots and loads the VR software using an IDE bus double-speed CD-ROM drive. A custom co-processor (CP) card provides sensor and control inputs to the computer and control output to the tension motor. It essentially acts as the "hub" of the system. Almost all the bikes' electrical components are directed and processed through the CP board. Along with the sound card, VGA card, and IDE card, the CP board is in an ISA expansion slot on the motherboard. It receives input signals from the following components:

1. Tilt sensor

2. RPM sensor (via the brake board)

3. PWM or "force" sensor (via the brake board)

4. Monitor switch overlay

5. Hand grip switches, left and right (via the IC board)

6. Heart rate receiver (via the IC Board)

The CP board also controls the tension motor, fan, and routes sound to the speakers.

Resistance control system

Several of these components are located on the brake assembly, connected to the CP board by a single umbilical cable. The brake board, force sensor, and tension motor are all part of the motor assembly, which is located on the brake assembly. The brake board supplies power for the motor, as well as gathering the force sensor and RPM sensor inputs.

The RPM sensor detects pedaling via an encoder disc. Lines on the disc pass in front of the sensor's eye, and this pulse signal is translated by the CP board into pedal RPM's.

The tension motor and force sensor work together in applying and measuring pedal resistance. On the very end of the motor assembly bracket is a force sensor. The motor assembly is mounted on a pivot, with the tension motor on one end and the force sensor on the other. The friction belt is also attached to the motor and the assembly bracket.

During pedaling, the friction belt pulls up on one end of the motor assembly. This pushes the other end, with the force sensor, into the frame. The force sensor sends an analog signal, corresponding to the force level, to the PWM (Pulse Width Modulation) circuit, which is on the brake board. The PWM circuit converts it to a digital signal. This signal and the RPM signal are sent through the umbilical cable to the CP board.

The CP board attempts to match the actual resistance reported by the force sensor with the resistance requested by the VR software. It does this by sending loosening or tightening signals back down the umbilical cable to the brake board, which produces the appropriate power for the tension motor. The tension motor transmission has a 100:1 reduction gearing, which allows for very fine tension adjustments. Additionally, the speed of adjustments is about 60 times per second, which provides for very accurate and smooth pedal action.

Interconnect board

Connecting the speakers, hand grip switches, and heart rate receiver to the CP board is the Inter-Connect or IC Board. The IC board is located directly under the seat bottom, and combines these signals into one cable, which is routed through the swing frame to the CP board.

User switches

Each hand grip has three membrane switches. During normal operation the left hand grip switches control the *VIEW* and *MAP* features, as well as the *BRAKE*. The right hand switches control the increase/decrease resistance ("+" and "–" gears) and the on-screen *STATISTICS*.

Other user inputs are controlled by the monitor switch overlay, located on the lower right side of the monitor bezel. Functions controlled are *VOLUME* (up and down), *START*, *HELP*, *HOME*, and *TIME* (up and down).

Tilt sensor

The Tilt sensor is located just beneath the CPU Chassis. The sensor itself is identical to the RPM sensor, the only difference being the mounting bracket. It reads a wedge shaped encoder disc whose axis is the swing arm pin. As the swing arm tilts from side to side, the disc passes in front of the sensor eye. This signal is translated into "points".

Sound card

A Gravis wave table synthesis sound card provides the sound for the bike. It is in an ISA Expansion slot. Its outputs are routed through the CP board via a stereo phone jack.

VR software

The VR software runs on a standard double-speed CD-ROM drive, controlled by an integrated IDE card. Software is loaded on power up, and provides the user with a virtual world. The bike itself responds to two sources of information— user input (i.e. pedaling, turning, increasing gear level) and software. If the user rides on a "flat" surface in the VR World, resistance will remain constant unless the user inputs a different gear level. If the user turns or moves off of the "flat" surface, resistance is either increased or decreased accordingly. Example: User pedals along a "road," and turns off

the "road" onto "grass." Resistance increases. Additionally, pedaling faster or slower, plunging into "water," plummeting off a "cliff," or going up or down a "hill" will affect resistance. A fan located beneath the monitor blows to simulate wind resistance, and will increase or decrease as speed in the virtual world increases or decreases.

CD-ROM drive

The CPU electronically "checks" to verify that the CD is still in the drive at the rate of once every few seconds. Note: The CD is only read once, during boot-up. The remaining checks are for ID purposes only. If during operation the drive door is opened, or the CD is removed from the drive, the screen will go blank, and the following error message is displayed: *CD MISSING. INSERT CD, TURN OFF AND ON.*

1. Test mode

The VR Bike software features a comprehensive test mode, allowing all the major functions and sensors to be monitored and evaluated. To enter test mode, turn the bike off. Turn the bike on and press the "?" or *HELP* key when the colorful screen with the Tectrix logo is displayed.

The test mode screen is divided into five sections.

A. General information/ID

B. Numeric readout

C. Graphic display

D. Hand grip/monitor overlay icons

E. Communications test readout

A. General information/ID

The top section of the screen. Name of bike, model number, software version, and software serial number is displayed.

B. Numeric readout

Second section, just below general information section, displays numeric readouts to sensor inputs.

The numeric readout section covers the following topics:

"*Raw*" This is the unprocessed value from the force sensor. Optimum setting with NO force on sensor ("PWM zero offset") is 19-21. Range of adjustment is 0-176.

"*Torque*" Force sensor value after it has been processed. Units of measure are lawton-meters x 2.

"*Cmd*" This requests a torque value which the bike will try to match while the pedals are in motion.

"*Fan*" Displays requested fan speed. Default is 0, maximum is 255. May be adjusted by pressing the VOLUME up or down arrow keys on the monitor overlay. Resets automatically after exiting test mode.

"*RPM*" Displays pedal rotations. Can be used to verify CP board is receiving signal from RPM sensor. Forward pedal rotations are displayed as a positive number, while pedaling backwards will display a negative number.

"*Pulse*" Displays heart rate information, used to verify transmitter/receiver is functioning properly. Units are Beats Per Minute.

"*Tilt*" Displays tilt of swing arm, used to test tilt sensor. Right tilt displays positive number, while left tilt is displayed as negative number. Center point should be 0, ±1.

C. Graphic display

Displays a graphic representation of sensory inputs. Components covered are as follows: RPM A and B, Fan, Loosen/Tighten (tension motor), Tilt A and B, TxD, (transmit) RxD (receive) for the communications network, Force, (force sensor), and Pulse (heart rate).

D. Hand grip/monitor overlay icon

The hand grips and monitor overlay are represented in this section. Use is twofold.

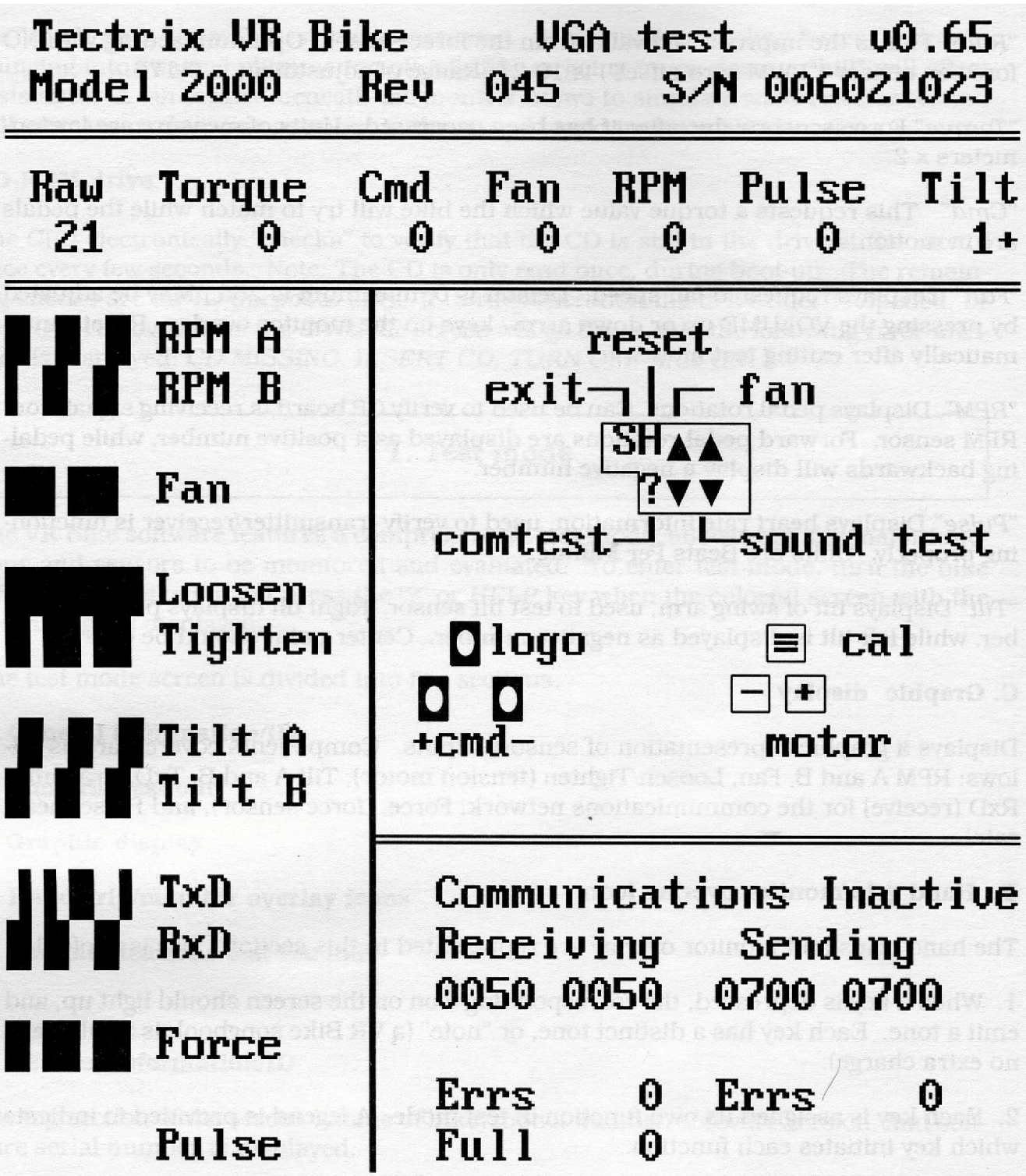
1. When a key is depressed, the corresponding icon on the screen should light up, and emit a tone. Each key has a distinct tone, or "note" (a VR Bike songbook is available at no extra charge).

2. Each key is assigned its own function in test mode. A legend is provided to indicate which key initiates each function.

Each key will be highlighted for as long as it is depressed. See test mode diagram (pg. 7) for key assignments.

E. Communications test readout

This section displays the status of the network, active or inactive, and the sending and receiving signals. See the electrical troubleshooting section.


Tectrix VR Bike VGA test v0.65
Model 2000 Rev 045 S/N 006021023
Raw Torque Cmd Fan RPM Pulse Tilt
21 0 0 0 0 0 1+
RPM A
RPM B
Fan
Loosen
Tighten
Tilt A
Tilt B
TxD
RxD
Force
Pulse
reset
exit
fan
SH
?
comtest
sound test
logo
cal
+cmd-
motor
Communications Inactive
Receiving Sending
0050 0050 0700 0700
Errs 0 Errs 0
Full 0

2. Setup mode

The setup mode is used to change the VR Bike's parameters. The setup parameters are described in the following table:

Parameter	Range of values	Factory settings
Default workout	1-60 minutes	20 minutes
Maximum workout	1-60 minutes	30 minutes
Default sound	0-100%	85%
Maximum sound	0-100%	100%
Language	Several settings are provided	English (Note: not all disks support multiple languages)
Workout pause	90 seconds (club) Unlimited (personal)	90 seconds

To run the setup program use the following procedure:

1. Turn off the VR Bike.
2. Turn the VR Bike back on and make sure a CD is in the CD-ROM drive.
3. Sit in the seat and locate the two lower buttons (black and white) on the left handlebar.
4. Wait while the VR Bike goes through the first stages of the power-on se quence.
5. A message will appear asking you to simultaneously press the two lower buttons on the left handlebar to run the setup program. Quickly press the two buttons. (If you wait too long, the program will continue the power-on sequence. In this case start over with step 1.)

Once in the setup mode, the number of hours which the VR Bike has been turned on, the number of hours it has been in use, and the kilowatt-hours of its use are clearly displayed. To modify the other parameters displayed on the screen use the buttons on the right handlebar and control panel as follows:

- The (≡) button is used to highlight a selection, such as maximum volume.

- The (+) and (–) buttons are used to change the value of the highlighted parameter.
- Press the *Home* button on the control panel to set the parameters to their factory defaults.
- Once you have the parameters set to your liking, press the *Start* button on the control panel to exit the setup mode.

The VR Bike's parameters are stored within the bike, not on the CD-ROM disc and will be kept in the VR Bike's memory even when the power is turned off. This means you only need to set it up once. You do not have to modify the setup when you switch world simulation discs. If the language or bikes are set to an option which is not supported by the world on the disc, the program will substitute an available setting.

Troubleshooting - electrical

3. No power to VR Bike

Important: a bike with no power may exhibit nearly identical symptoms as several other problems with the bike, i.e., bad video card, blown fuse in monitor, etc. To verify that there is indeed no power to the bike, a simple test will need to be performed. Remove the rear cover on the VR Bike. There are two locations on the CPU chassis that will indicate power to the bike. There is a small cooling fan mounted directly to the motherboard. If the fan is not running, then there is no power to the bike. Additionally, the CP board has two small red LED's. These will also indicate a lack of power to the bike if not lit.

3.1 Switch plate assembly

Check that all wires are connected on the switch plate assembly. Using a multimeter, check that the power switch is supplying the rated wall outlet voltage (i.e. 110 or 220 VAC) to the back of the power switch. CAUTION: Care is required when reading high voltage. Do not touch the two leads of the meter together during the test as this can create a short. If no AC voltage is present at the power switch try a different power cord. Make sure that the wall outlet has power. If the outlet tests good, replace the switch plate assembly.

3.2 Power supply

Verify the power supply is connected to the switch plate assembly. There is a standard IEC 320 connector on the power supply end of the cord. Verify this is pushed in all the way. Pull the end of the cord out of the power supply. Test the end of the plug for the rated wall outlet (i.e. 110 or 220 VAC) voltage. If cord tests good, remove the four-pin connector supplying power to the CPU fan. Using the multimeter, test pin 1 (12 VDC) and pin 2 (ground). If 12 VDC is not present, replace and test power supply.

3.3 All connections

Check all the connections coming out of the power supply at each component.

4. No video

4.1 Power supply

Verify that the power supply is operational, and that the video monitor is connected to the power supply.

4.2 VGA card

To test for a bad or disconnected VGA card, turn the bike on. Then, while watching the screen, have an assistant turn the bike off. If the VGA card has failed or been disconnected, a "pop" or flash of light will be briefly visible on the monitor screen, which will then diminish to the center of the screen. This indicates that the monitor has power, but is receiving no signal from the VGA card. If flash is visible, but no video comes on the monitor, replace the VGA card (see figure 7). When operational, the monitor will also emit a high pitched tone at 15 kHz. If no "pop" or flash is visible, please refer to the next section.

4.3 Monitor (fuse)

The video monitor is equipped with a 3.15 Amp fuse. The fuse is located next to the power input connector. With the power off, check the fuse with the multimeter for zero Ohms (good). Replace if necessary. If the fuse tests good, or blows again, replace monitor.

5. No CD/CD error message

During boot-up, the CP board attempts to locate the CD-ROM drive and loads the software. If at any time the CP board fails to locate the CD-ROM drive, the boot-up process is stopped, and the following error message is displayed on the screen: *CD-ROM DRIVE UNPLUGGED OR DEFECTIVE.*

The CPU electronically "checks" to verify that the CD is still in the drive at the rate of once every 15 seconds. Note: The CD is only read once, during boot-up. The remaining checks are for ID purposes only. If during operation the drive door is opened, or the CD is removed from the drive, the screen will go blank, and the following error message is displayed: *CD MISSING. INSERT CD, TURN OFF AND ON.*

5.1 No power to CD-ROM drive

Verify the CD-ROM drive has a four-conductor power connector plugged into it. The small horizontal button on the right side of the drive will be lit when the bike is receiving power. If the button is not lit, check the connection from the power supply into the back of the CD-ROM drive. If connection is good, replace and test the CD-ROM drive.

5.2 Drive has power

If the CD-ROM drive has power, check the IDE ribbon cable connecting the motherboard to the CD-ROM drive. If connection is good, then replace and test parts in the following order. 1) CD-ROM drive. 2) IDE cable.

6. GPF or parity error message

The VR Bike can give motherboard-related error messages during the two primary operation modes, boot-up and normal operation. Error messages are variable, but all motherboard errors have some similarities. The message will have a "parity error" or "GPF" error designation, usually followed by a string of letters and numbers. These numbers are the memory address of the error. Additionally, the screen may ask you to turn the machine off, and back on again. If an error message occurs during boot-up, cycle the power, and re-boot. If the bike continues to "lock up" before reaching normal operation mode, replace the motherboard (see figure 7). If the error message occurs during normal operation, cycle power on the bike. If the problem persists, or occurs more than once a week, replace and test the motherboard. The VR Bike, being based on computer technology, may experience random error messages that cycling the power will take care of. This is not uncommon in personal computers. It is only when the frequency increases or displays itself consistently that it becomes a problem.

For CD-ROM error messages, please see section 5.

7. Bike defaults to test mode

Incorporated into the VR Bike software is a limited self-test. If the bike detects one of several problems, upon booting up it will default into test mode. There are two instances in which this will occur.

1. A shorted or "stuck" key on one of the membrane switches (hand grips, monitor overlay).

2. The CP Board does not initialize or is not operational.

7.1 Frozen membrane switch (hand grips, monitor overlay)

If a key has frozen, it will be displayed or highlighted in yellow in the test mode. To test this, disconnect the indicated switch from the CP board, and re-boot. The bike should proceed to complete the boot process, and operate normally (with, of course the exception of the disconnected switches, which will not respond). Replace the shorted switches.

7.2 CP board

If the CP board fails, or is not seen by the motherboard, the bike will also default into test mode. If this happens, replace with a known good CP board (see figure 7).

8. Bike hangs or "freezes" with no error message

8.1 Sound card

This may be due to an unusual interaction between the sound card and the motherboard. If this occurs, replace the sound card (see figure 7). If this fails to correct the problem, replace the motherboard.

9. No sound

Verify that all connections in between the sound card, CP board, IC board, and speakers are good. If all connections test good, test and replace these parts in the following order: 1) sound card. 2) speakers (see figure 6).

HINT: The sound card has an outlet for a stereo phone jack. If a set of headphones is available, they can be used to determine if the sound card is functioning properly. If sound is received through the stereo phone jack, the sound card is good. The stereo jack must be in the outermost jack on the sound card.

10. Sound in one speaker only

If one speaker has sound, and the other doesn't, there are three possibilities.

1. Speaker is disconnected from IC board.

2. Stereo phone jack is partially plugged in to sound card.

3. Speaker has failed (replace speaker).

11. No resistance or forward motion in VR world

The VR Bike uses two sensory inputs to determine resistance and forward motion in the VR World: pedal RPM and pedal force, which are measured by the RPM and force sensors. These are the two most important ways the bike verifies a user attempting to exercise. If either of these inputs is not detected by the CPU, the bike will assume one of two things. 1) There is no one on the bike. 2) There is someone on the bike, but they are not pedaling. In either case, the bike will not provide resistance or motion through the world.

Verify that the monitor image has not frozen (see section 8). Steering should work, as well as the gear display when the increase or decrease buttons are pressed on the right handlebar. The only noticeable difference from normal operation will that be the bike will not move forward in the virtual world, and resistance will not change when requested.

11.1 Friction belt

If the friction belt has broken, or come off the drive wheel, the CP board will attempt to tighten the motor, but will not be able to cause the force sensor to push into the frame, which the machine will interpret as "no input." Replace friction belt if there is visible damage.

11.2 RPM sensor

The RPM sensor, located in the brake assembly, may either have malfunctioned, or become disconnected from the brake board on the motor assembly. Verify the RPM sensor is plugged in at connector J5 on the brake board. If sensor is plugged in, inspect the RPM disc. It should be free from dust, and the radial lines extending from the center of the disc should be unbroken. Additionally, the RPM sensor should be positioned properly in relation to the disc (see figure 16). If the RPM sensor is plugged in and aligned properly, Put the bike in test mode (see section 1). If no RPM signal is visible, replace and test parts in the following order: 1) RPM sensor 2) umbilical cable 3) motor assembly.

12. No tilt or bike steering in circles

Verify the swing arm is not tilted to the left or right. It is possible the CP board is receiving improper signals from the tilt sensor. The software is equipped with a center point re-initialization procedure. CAUTION: The seat must not be tilted while reinitializing, or the same problem will occur.

To re-initialize, press the volume up and down arrow keys simultaneously, with the bike in the upright position.

This resets the "center point" of the tilt sensor. In other words, when the two keys are pressed, you are telling the bike the swing arm is currently "straight up and down", and that position becomes zero tilt. If the bike realigns, but then reverts back to steering in circles, try cycling the power. For a bike which will not re-initialize, please see the following sections.

12.1 Tilt sensor

Verify the tilt sensor is plugged in properly at connector J5 on the CP board.

Place the bike into test mode. The tilt sensor should read "0". Tilt the swing arm back and forth. As it tilts to left the numbers should decrease, starting at "0" and going to "-45", ± 3 points. As the bike tilts to the right the numbers should increase, starting at "0" and going to "+45", ± 3 points. The sensor itself is a two channel device. Watch both channels in the graphic display. If either side does not respond, or the upright position is something other than "0" ± 1, inspect tilt disc for damage. If disc is OK, replace and the tilt sensor test with known good tilt sensor.

If condition persists, replace the CP board (see figure 7).

13. Resistance is not the same between two bikes

Calibration must be performed to have consistent resistance, calorie and speed read-outs from bike to bike. This will be most needed in a location where there are two or more bikes, and/or if they are networked via a Smartlink cable.

To calibrate the VR Bike, perform the following procedure.

1. Remove the covers off of the brake assembly.

2. Put the bike in test mode.

3. Verify the value of the PWM zero offset. This is the value indicated in the top left hand corner of the monitor, with the word "*raw*" above it. This value should be in between 19-21, with 20 being optimal. This is accomplished by adjusting the potentiometer labeled "VR1" on the motor assembly brake board. (Note: this adjustment must be made with NO tension on the force sensor or pedals.)

4. Press the uppermost button on the right handlebar (on the monitor, the button is also marked "calibrate"). This will put the bike in calibration mode, which applies tension to the friction belt.

Caution: Do not leave the VR Bike in calibration mode for any extended period of time, as this may damage the motor.

5. Using a torque wrench, apply 30 ft-lbs of pressure to the right crank shaft bolt. Release after applying the proper pressure.

6. Press the "calibrate" key again. This performs the calibration.

7. Check the calibration by pressing the *HOME* key once, pressing the calibrate key again, and applying 30 ft-lbs of torque again. The torque display should read between 84 and 88. Press the calibrate key again to complete calibration.

8. Press the "-" key to release tension on the motor, press the start button on the monitor to exit test mode. This will store the calibration value.

Note: The microprocessor calculates its calibration value under the assumption that 30 ft-lbs was the maximum torque attained. If this value is set inaccurately, the VR Bike will not apply proper resistance to the pedals.

14. Low resistance in higher gears/incorrect calorie readout

See previous section.

15. Excessive resistance

To determine resistance, the VR Bike takes a reading off of the force sensor as it is pushed into the striker plate. If the CP board does not "see" the force sensor, it assumes that there is no force being applied to the sensor. The CP board will then attempt to get a reading from the force sensor by sending the command to the motor to tighten the friction belt. This feedback loop is repeated and the resistance becomes too difficult.

15.1 Calibration

See Section 13.

15.2 Force sensor

Verify the brake board is connected to the CP board via the umbilical cable. Place the bike into test mode. The raw force sensor reading should be at approximately 20. The range of force sensor adjustment is from 0 to 176. If the bike displays a raw readout of zero, attempt to adjust VR-1 on the brake board. If there is no response, the force sensor has failed. Replace the motor assembly.

16. No response from hand grip switches

Place the bike in test mode. Test the hand grip switches by pressing each of them. If there is no response, check the connections at the IC board. If connections are good, test speakers as well. If the speakers do not respond, check the cable connecting the IC board to the CP board. If connection is good, replace and test parts in the following order: 1) Hand grip switches (see figure 13). 2) CP board (see figure 7). 3) cable.

17. Red bike always kicks your butt

17.1 Pedal faster

Hint: The Red bike will pace you if a reasonable speed is maintained. Wait until the last one or two tenths of a mile, shift into 15th gear, and pedal like the police are after you.

17.2 Cheat

If method number one fails, try re-calibrating the bike with the potentiometer set at 176, and using 15 ft/lbs of pressure. Speeds in excess of 40 m.p.h. should be easily attainable, and the poor Red bike won't know what happened!

18. Bikes do not network

SmartLink™ Communications

The VR Bike has two built-in SmartLink ports: in jack, out jack as shown in Figure 2. These ports are designed to link with other VR Bikes. Multiple VR Bikes can be linked together, allowing you to ride simultaneously in the same virtual world with other cyclists.

If you have more than one VR Bike, plug in the communications cable provided (looks like a telephone cord but cannot be interchanged with one) to the out jack (b) of each VR Bike, then to the In jack (a) of the next VR Bike and continue until all VR Bikes are connected. Then, terminate the first in jack (a) and the last out jack (b) with the termination plugs provided to complete the communication ring. If the bikes are not networked, termination plugs should be inserted into (a) and (b) of each bike.

All VR Bikes connected via SmartLink will be networked. However, only VR Bikes running the same virtual world will interact.

There are two types of bikes in the VR world: a) user controlled and b) computer controlled. Computer controlled bikes appear in all the races. They are colored differently, which helps to measure your progress and position in a race.

The Red bike is notoriously the most cruel, and wins almost all races. He seems to stay just in front of you, and if you pass him, he waits until you're near the finish line to destroy your ego (and your first place position in the race).

User controlled bikes are color coded as well, but have a black top to indicate they are being controlled by someone on another bike. In the Map view, user controlled bikes are represented by a large square, with each user seeing himself as a flashing arrow. The arrow indicates direction of travel in the VR World.

Computer controlled bikes are represented by smaller squares. Multiple users can be networked together. Each bike can be anywhere in the VR World. If another bike is not visible in normal view, try the overhead View or Map function to locate the other bike(s). VR Bikes which are networked may not appear to be, because the other bike may not be in close proximity in the VR world.

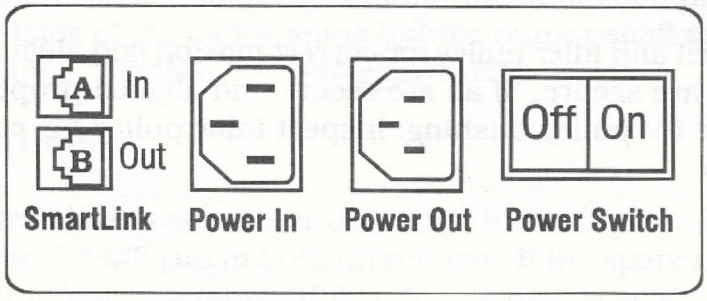
18.1 Test cables/terminator plugs

Place the VR Bike in test mode. If the Smartlink circuit is not being completed, the communications test will display "Inactive". To test cables, remove terminator plug, loop the other end of the communications cable back into port on switch plate. If communications stays inactive, replace cable.

If communications goes active, test terminator plugs by removing cable and putting terminators into both ports. If communications stays inactive, replace terminators. If bike #1 tests OK, test remaining bikes in loop with known good cables. When the malfunctioning bike is found, check switch plate assembly, and the communications cable from the CP board to the switch plate assembly. Test with parts off of known good bike, and replace if necessary.

18.2 No one on other bike

A VR Bike must be in use by a rider to be visible in the VR world. Locate someone of relatively the same build and physical condition, persuade them to get on other bike, and proceed to trounce them in the Short race. Not only will the network test be completed, but you will regain the self-confidence lost by being pummeled by the Red bike.



19. Grinding noise while pedaling

Remove the covers. Verify where the noise is coming from.

19.1 Drive wheel noise

There are several parts which may cause a noise to emanate from the drive wheel.

1. Kevlar friction belt. The Kevlar friction belt has a screw and a nut attaching the Kevlar material to the belt leader. Verify that the screw is not rubbing against the drive wheel.

2. 50mm radial bearing (see figure 3). If the noise occurs when pedaling forward but does not occur when coasting or pedaling backwards, replace the bottom bracket assembly which includes the 50mm radial bearings.

3. 25mm roller clutch (see figure 3). If the noise occurs when coasting or pedaling backwards, replace the drive wheel hub assembly which includes the 25mm roller clutch and the 25mm roller bearing.

19.2 Flywheel noise

Verify the following: 1) The two 1/2"-20 hex nuts on the flywheel axle are secure . 2) The flywheel clamp plate is secure. 3) The RPM sensor and disc are aligned properly (see figure 16). 4) The drive belt is aligned properly. If all are secure and aligned properly and the noise continues, replace the flywheel assembly which will include the three bearings.

19.3 Idler pulley noise

Check the drive belt and idler pulley for correct tension and alignment and that the three 1/2"-20 x 1" bolts are secure. If all are secure and aligned properly and the noise continues replace the PV pulley bushing. Inspect idler pulley for rubber residue, and remove if necessary.

20. VR bike does not freewheel

If the VR Bike pedals lock up while trying to freewheel, or the pedals force the user's legs forward while trying to stop or slow down, the 25mm clutch bearing in the hub assembly (see figure 3) may have seized. Replace and test these parts in the following order: 1. hub assembly w/bearing 2. clutch shaft.

21. No resistance in pedals

21.1 Friction belt/drive belt

Remove the cover. Verify that the friction belt and the drive belt are aligned properly and are functional. Replace if required.

21.2 Motor assembly

Enter test mode and run the motor in both directions by using the hand grip keys. If the motor is not running refer to section 21.5. (Note: The motor will run only for as long as the key is pressed)

21.3 Electrical cables

If the belts are OK, check for any loose connections or wires around the motor assembly.

21.4 Motor runs

If the motor runs, visually check that the motor shaft is not spinning inside the pulley on which the belt is attached and that the motor does not have a stripped gearbox. If the motor shaft is spinning inside the pulley, remove the motor assembly and tighten the set screws that hold the motor pulley to the shaft. Make sure that one of the two set screws is on the flat portion of the shaft. To verify that the motor does not have a stripped gearbox, look at the armature shaft on the outside of the motor. If the armature shaft on the outside of the motor spins but the output shaft and belt pulley do not, the gearbox is stripped. Replace the motor assembly.

21.5 Motor doesn't run

Unplug the motor cable from connector J3 on the brake board. Plug in the spare motor assembly and see if it will run in both directions. If the spare motor assembly runs, replace the original motor assembly. If you do not have a spare motor assembly, use your multimeter (observe polarity!) to verify voltage at connector J3 on the power board. Place the bike in test mode. Measure the voltage across the two pins of J3 while an assistant presses the + and - arrow keys on the display console. Note: The probes must be on the test points BEFORE pressing the keys. J3 voltage with no load should read

approximately 10 to 12 volts DC. If you do read the expected voltage, replace the motor assembly. If the voltage is incorrect, replace and test each of these parts in the following order: 1. Motor Assembly 2. Umbilical Cable 3. CP Board.

22. Black dust under brake assembly/on swing arm

Black dust in or under the brake assembly is an indication of a problem with the drive belt. Check the condition of the drive belt and replace if necessary. Verify that the drive belt has only 1/2" of play and is not too loose (more than 1/2" of play). If the drive belt is too loose, adjust the tension of the drive belt. The other possibility is that the drive wheel and the flywheel are out of alignment. Perform the flywheel adjustment procedure to align the drive belt (see figure 8).

23. Scraping sound while pedaling (covers)

The covers may be misaligned or off-center. To test, remove the covers. If sound persists, see previous section. If removing covers solves problems, inspect rear cover mounting bracket. Verify the bracket is not pivoted to either side, and the bolt holding the bracket in place is tight.

24. Brake assembly does not adjust

24.1 Adjust pin

Remove the brake assembly covers. The top of the adjust pin should be visible in one of the brake assembly adjust holes. Pull up on the adjust pin handle beneath the seat. Verify the adjust pin in the swing frame retracts far enough to allow the brake assembly to slide freely. If the pin does not retract, the brake adjust cable may have broken or detached from the adjust pin assembly. Verify the cable has all the slack removed from the adjustment. This is done by tightening the T-nut attaching the cable to the adjust handle (see figure 14).

24.2 Brake assembly rollers

If the adjust pin assembly works properly the brake assembly rollers may be misadjusted, causing the brake assembly to bind. Verify the brake assembly will roll freely when the adjust handle is lifted. If the brake assembly does not roll freely, the rollers must be adjusted. To adjust rollers, loosen the eight 1/2" bolts (two per bracket) that attach the bottom roller bracket to the brake assembly. Loosen the four Phillips head screws (one per bracket) that tension the rollers against the swing arm. Turn

screws in 1/2 revolution increments, and test. Retighten bolts when brake assembly moves freely. Verify the brake assembly does not rock side to side.

25. Swing arm does not tilt

Steering cable

Remove the seat covers, and inspect the two horizontal cable pulleys. Verify each has a cable routed around it. Also, verify both are intact and undamaged. Replace any broken/damaged cables (see figure 15).

26. No tilt in VR world

Tilt disc

Inspect the tilt disc, located just below the CPU chassis. Verify that the lines are unbroken and undamaged. Replace if necessary. Additionally, check the alignment of the RPM sensor and connections (see electrical troubleshooting, section 12).

Part replacement - mechanical

Recommended tools:

set of open end wrenches (std.)	*#2 Phillips screwdriver*
adjustable jaw wrench	*crank arm puller*
retaining ring pliers (lg.)	*retaining ring pliers (sm.)*
pliers	*multimeter*
small flathead screwdriver	*set of nut drivers*
torque wrench	*socket set*
socket wrench	*diagonal cutters*

27. Seat cover

Tools: Phillips head screwdriver
1/2" socket

To remove the seat covers, you must first remove the seat bottom in order to access the top two screws. Remove the four 1/2" nuts securing the seat bottom to the frame, and remove the seat bottom. Remove the nine Phillips head screws, and remove the covers. Hint: To get the cover over the handlebars, rotate the cover 90° as you pull it away from the frame, so that the larger half of the cover is closest to the floor. To replace, repeat the steps in reverse order.

28. Brake assembly cover

Cover removal

Tools: Phillips head screwdriver

Remove the three screws securing the covers to the brake assembly. Align the left pedal/crank arm vertically, with the pedal at the top. Pull the cover towards you, while lifting up. Repeat for the right side.

Cover replacement

Each cover has an interlocking lip or ridge on its edge. The right cover must be installed first, because the left cover's edge will fit over it. Replace the right cover, making sure the screw holes line up with the holes on the brake assembly. The bottom of the cover is secured with Velcro. Replace the left cover, aligning the edge of the left cover over the lip on the right cover. The two pieces should snap in place, and the screw holes should line up.

Once the covers are together, location of the screw holes in the brake assembly may be difficult. If the holes in the covers line up, but do not line up with the screw holes in the brake assembly, try lifting one edge of the left cover off of the right, to allow the covers to move enough to locate the holes. Reassemble the covers, and replace the three Phillips head screws.

29. Rear monitor stand cover

The rear monitor stand covers the tilt sensor, power supply, switch plate assembly and the CPU chassis. It has edges on either side which fit into grooves on the monitor stand. To remove the cover, you must first slide off the small gray panel just above the monitor stand cover. Place your knee gently on the center of the monitor stand cover, while holding the top of the cover. Apply pressure gently with your knee until the sides of the cover spread out. Pull on the top, and the cover should pop right off. To reinstall, simply line up the grooves in the bottom for the wheel, and press into place. the cover should snap back into the grooves.

30. Seat bottom

Tools: 1/2" socket or open end wrench

Remove the four 1/2" nuts securing the seat bottom to the swing arm, and lift off. Repeat in reverse order to replace.

31. Seat back

Tools: 1/2" socket or open end wrench

Remove the seat covers (see section 27). Disconnect the speakers (left speaker, connector J2, right speaker, connector J3) from the IC board, located underneath the seat bottom. Remove the four 1/2" bolts in the seat back tubes, and remove the seat back assembly. To replace, repeat steps in reverse order. **Caution:** The speaker cables are routed through the seat back tubes. Be careful not to damage them when sliding the bolts through during installation or replacement.

32. Steering cables

Tools: 1/2 socket or open end wrench
1/4" open end wrench (or adjustable wrench)

32.1 Cable removal

Remove seat covers (see section 27). Visually locate the steering cables. The cables wrap around the two horizontal pulleys on the swing arm. The left cable must be removed first to allow access to the right cable, which is mounted behind the left. The end of the cable has a hex-shaped body, which permits a wrench or pliers to grasp the cable to prevent it form turning while removing or adjusting the cables. Secure the hex cable end with a 1/4" open end wrench or adjustable wrench, and remove the 1/2" nylock nut, and pull cable out of the swing arm. The 1/2 jam nut will need to be removed as well. Turn the handlebars to the right, to allow access to the handlebar-cable mounting point, and remove the cable. Repeat (if necessary) for the right side.

32.2 Cable replacement/adjustment

Thread the new cable through the hole in the handlebar, so that the ball end is on the inside of the bracket. Thread the 1/2" jam nut about halfway on to the cable end. Route the cable around the cable pulley, and place in the hole in the swing frame. Thread the 1/2" nylock nut onto the end of the cable, but do not tighten. Repeat for the other side (if necessary). To adjust the cable, tighten the 1/2" nylock nut while holding the cable end secure. Be careful not to over-adjust either cable, so that the handlebars are turned to one side or the other when the bike is in the upright position. When properly adjusted, the handlebars should be perpendicular (at right angles) to the swing arm. Hint: The cable ends should have about the same amount of thread showing on both sides. The cables should have moderate tension on them, enough to prevent the handlebars from being loose, but not enough to cause them to bind or hinder the motion of the handlebars.

33. Handle bars

Tools: 1/2" socket
open end wrench

Remove the covers (see section 27). Remove the steering cables (see section 32). Disconnect the hand grip switches from the IC board (left switch, connector J4, right switch, connector J5). The handlebar is clamped at the top and bottom of its shaft (see figure 12). Locate the four 1/2" bolts securing the clamps, and remove. Remove the handlebars by pulling out from the left side, and twisting clockwise slightly. To replace, repeat the steps in reverse order.

32. Steering cables

Tools: 1/2 socket or open end wrench
1/4" open end wrench (or adjustable wrench)

32.1 Cable removal

Remove seat covers (see section 27). Visually locate the steering cables. The cables wrap around the two horizontal pulleys on the swing arm. The left cable must be removed first to allow access to the right cable, which is mounted behind the left. The end of the cable has a hex-shaped body, which permits a wrench or pliers to grasp the cable to prevent it form turning while removing or adjusting the cables. Secure the hex cable end with a 1/4" open end wrench or adjustable wrench, and remove the 1/2" nylock nut, and pull cable out of the swing arm. The 1/2 jam nut will need to be removed as well. Turn the handlebars to the right, to allow access to the handlebar-cable mounting point, and remove the cable. Repeat (if necessary) for the right side.

32.2 Cable replacement/adjustment

Thread the new cable through the hole in the handlebar, so that the ball end is on the inside of the bracket. Thread the 1/2" jam nut about halfway on to the cable end. Route the cable around the cable pulley, and place in the hole in the swing frame. Thread the 1/2" nylock nut onto the end of the cable, but do not tighten. Repeat for the other side (if necessary). To adjust the cable, tighten the 1/2" nylock nut while holding the cable end secure. Be careful not to over-adjust either cable, so that the handlebars are turned to one side or the other when the bike is in the upright position. When properly adjusted, the handlebars should be perpendicular (at right angles) to the swing arm. Hint: The cable ends should have about the same amount of thread showing on both sides. The cables should have moderate tension on them, enough to prevent the handlebars from being loose, but not enough to cause them to bind or hinder the motion of the handlebars.

33. Handle bars

Tools: 1/2" socket
open end wrench

Remove the covers (see section 27). Remove the steering cables (see section 32). Disconnect the hand grip switches from the IC board (left switch, connector J4, right switch, connector J5). The handlebar is clamped at the top and bottom of its shaft (see figure 12). Locate the four 1/2" bolts securing the clamps, and remove. Remove the handlebars by pulling out from the left side, and twisting clockwise slightly. To replace, repeat the steps in reverse order.

34. Tilt cables

34.1 Cable adjustment

Tools: 1/2" socket
1/2" open end wrench
9/32" open end wrench (or adjustable wrench)

The tilt cables can be adjusted to determine the ease with which the swing arm will pivot through the center point, or "detent". Remove the covers (see section 27). Locate the end of the tilt cables, which are mounted on the top of the swing arm. Loosen the 1/2" jam nut on the cable end. Place the 9/32" wrench on the hex cable end, to prevent the cable from twisting while tightening or loosening.. To make the center detent more pronounced, tighten the 1/2" nylock nut on the cable end. Note: be sure to tighten each end the same amount. To diminish the center detent, loosen the 1/2" nylock nut. Adjust to desired preference. Tighten the jam nut to hold the adjustment in place. reinstall the covers.

34.2 Cable pulleys

Tools: 1/2" socket

Remove the covers (see section 27). Loosen the steering cables enough to slide the cables off the pulleys. Remove the 1/2" bolt, and replace. Reinstall the cables and covers.

35. Brake (umbilical) cable

Tools: #2 Phillips head screwdriver
adjustable jaw pliers
diagonal cutters
cable ties (2)

Remove the rear monitor stand cover (see section 29), and the brake assembly cover (see section 28). Disconnect the brake cable from the brake board at connector J2, and from the CP board at J1. Cut the cable ties securing the cable to the kick plate spacers. Remove the flat nut securing the cable to the brake assembly frame, and the nut securing the cable to the monitor stand (see figure 9). Remove the cable. To replace, repeat the directions in reverse order. make sure to secure the cable to the kick plate spacers with the cable ties. Reinstall the covers.

36. Brake assembly rollers

36.1 Top rollers

Tools: #2 Phillips head screwdriver
1/2" socket
1/2" open end wrench

Remove the brake assembly covers (see section 28). Loosen the Phillips head screw on the brake roller bracket, as well as the two 1/2" bolts on each bracket (see figure 9). Place a wedge or spacer in-between the brake assembly and the swing arm to lift up the assembly. Remove the 1/2" bolt holding the top roller to the brake assembly frame, and remove the roller. To replace, repeat steps in reverse order. See section 24 for adjustment of roller.

36.2 Bottom rollers

Tools: #2 Phillips head screwdriver
1/2" socket

Remove the brake assembly covers (see section 28). Loosen the Phillips head screw and 1/2" bolts on the brake roller bracket (see figure 9). Remove the bottom rollers via the 1/2" bolt. To replace, repeat steps in reverse order. See section 24 for adjustment of roller.

37. Adjust pin assembly

Tools: Phillips head screwdriver
1/2" socket
needlenose pliers

Remove the brake assembly covers (see section 28). In order to access the adjust pin assembly, the entire brake assembly must be removed. Disconnect the two bungee cords that hook onto the front brake roller bracket. Remove the four Phillips head screws and eight 1/2" bolts securing the bottom rollers to the brake assembly. Loosen the bolts that hold the bottom roller to the brackets, and remove the brackets from the brake assembly. Gently lift the entire brake assembly off of the swing arm (be careful, it's heavy) and set it to the side. The adjust pin assembly should be visible. Tilt the swing arm to allow access to the two 1/2" nuts holding the adjust pin assembly to the swing arm (see figure 14). Remove the two 1/2" nuts. The adjust pin will now lift out of the top. To disconnect the adjust cable, tighten the cable end in the t-nut, grasp the cable end, and push the ball end of the cable out of the adjust pin handle. To replace, repeat the steps in reverse order. **Hint:** to reconnect the adjust cable, tighten the cable end all the way into the t-nut, and depress the adjust pin with your foot, to allow enough slack

to put the ball end of the cable into the adjust pin handle slot. Loosen the cable end, and test. Adjustment is complete when the adjust pin will retract flush with the swing arm. reinstall the brake assembly, and adjust rollers (see section 24).

38. Tilt disc

Tools: rubbing alcohol

To replace the tilt disc, follow these steps. Remove the monitor stand covers (see section 29). The tilt disc is located just below the CPU chassis. Remove the tilt sensor (see section 57). The disc is held to the tilt disc bracket with adhesive. Peel the disc off. Clean the surface of the disc bracket with rubbing alcohol to remove any adhesive residue. Peel off the backing on the new disc, and replace. Reinstall the tilt sensor and monitor stand cover.

39. Pedal replacement

Tools: 15mm open end wrench

CAUTION: The right side pedal is right hand threaded and the left side pedal is left hand threaded.

Using your 15mm open end wrench, unscrew the pedal from the crank arm. To reinstall, screw the pedal into the crank arm taking care to verify that the pedal flange meets flush with the crank arm. The pedal must be tightened all of the way to the crank arm to provide the strength necessary to withstand the weight of the user.

40. Crank arm replacement

Tools: 9 /16" socket and torque wrench
crank arm puller
flathead screwdriver

40.1 Crank arm removal

Remove the crank shaft cap with the flathead screwdriver. Remove the 9/16" bolt from the drive wheel shaft. Screw the large threads of the crank arm puller into the crank arm (where the bolt was removed) and remove the crank arm by threading the inner portion of the crank puller in the clockwise or tightening direction. This will cause the crank arm to be pulled off by applying even pressure to the end of the clutch shaft.

40.2 Crank arm replacement

There is a right crank arm and there is a left crank arm. They are not interchangeable. Look on the crank arm. The letter "R" is stamped on the right crank arm and an "L" is stamped on the left crank arm. Place the crank arm on the drive wheel shaft with the letter (R or L) facing the VR Bike frame. Tighten the crank arm to the drive wheel shaft by applying 30 ft/lbs. of torque to the crank arm bolts. Note: Install the crank arms at 180° degrees from each other. Replace the crank shaft cap.

41. Drive wheel assembly

Tools: #2 Phillips head screwdriver 3/4" open end wrench
flathead screwdriver crank arm puller
1/2" socket retaining ring pliers (sm.)
retaining ring pliers (lg.)

41.1 Clutch shaft removal

Remove the brake assembly covers (see section 28). Remove the right crank arm (see section 40). Use the #2 Phillips screwdriver to remove the three screws (and spacers) holding the kick plate to the frame. Remove the screw securing the RPM sensor and move the sensor and cable out of the way. Use the small retaining ring pliers to remove the small retaining ring from the clutch shaft. Remove the washer, RPM disk, washer, thrust bearing, washer and spring washer and set aside. **Tip**: Keep all these components in order, as it makes replacing easier. Press on the right side of the drive wheel shaft. The clutch shaft with the left crank pedal, left crank arm, small retaining ring, washer, thrust bearing and washer will slide out of the left side of the drive wheel. To reinstall, follow the instructions in the reverse order. Lubricate the shaft with a heavy duty, rust inhibitor multipurpose lubricant (example: LPS manufactured by LPS Laboratories). Lubricate the thrust bearings with a polymer grease (example: Clenesco Polylube).

41.2 Drive wheel removal

Remove the clutch shaft (see section 41.1). Remove the friction belt (see section 43). Loosen the 3/4" bottom bolt and the 3/4" top (pivot) bolt on the idler arm assembly (see figure 6). Slide the idler arm to loosen the drive belt. Slide the drive belt off of the drive wheel. Remove the large retaining ring from the drive wheel hub assembly on the right side of the VR Bike. From the left side of the VR Bike, grasp the drive wheel and pull with an even pressure. CAUTION: Do not pull on the drive wheel with uneven pressure. The drive wheel, hub assembly, and the large wave spring will slide out of the VR Bike bottom bracket assembly. To reinstall, follow the instructions in the reverse order. Lubricate the outside of the drive wheel hub with a heavy duty, rust inhibitor multipurpose lubricant (example: LPS manufactured by LPS Laboratories).

41.3 Drive wheel hub assembly removal

Remove the drive wheel (see section 41.2). Remove the large wave spring. Unscrew the hub assembly from the drive wheel. The large retaining ring will come off with the hub assembly. Press-fit into the hub assembly are a roller bearing and a clutch bearing. Since these two bearings are press fit into the hub assembly, replace the hub assembly any time either of these bearings need replacement. To reinstall, follow the directions in reverse order taking care to lubricate where indicated and that the large retaining ring on the hub assembly is located in the last groove of the threads.

41.4 Bottom bracket assembly removal

Remove the drive wheel (see section 41.2). Using the 1/2" socket wrench, remove the four bolts holding the bottom bracket assembly to the frame. The two large radial bearings come out with the bottom bracket assembly. Since these bearings are press-fit into the bottom bracket assembly, replace the bottom bracket assembly with the bearings installed whenever these bearings need replacement. To reinstall, follow the directions in the reverse order.

42. Flywheel assembly

Tools: #2 Phillips head screwdriver
3/4" socket wrench
3/4" open end wrench
flathead screwdriver

42.1 Flywheel assembly removal

Remove the brake assembly covers (see section 28). Loosen the bottom 3/4" bolt and the top (pivot) 3/4" bolt on the idler arm assembly. Slide the idler arm to loosen the drive belt. Slide the drive belt off of the drive wheel. Remove the three Phillips head screws securing the flywheel clamp plate to the frame. Remove the flywheel clamp plate. Remove the RPM sensor by removing the single Phillips head screw securing the RPM sensor assembly to the frame. Remove the outermost 3/4" nut from the left side of the flywheel axle. Move the drive belt out of the way of removal of the flywheel assembly. Slide the flywheel assembly to the right (taking care not to scratch the RPM disc against the frame) to slide the flywheel axle from the hole in the frame assembly. Pull up on the flywheel assembly to remove it from the frame. The three bearings are press fit into the flywheel. Replace the entire flywheel assembly whenever the bearings need replacement.

42.2 Flywheel axle removal

Remove the flywheel assembly (see section 42.1). From the left side of the flywheel, remove the 3/4" nut and the E-ring. Push the flywheel axle through the flywheel. Take care not to scratch or dent the RPM disc. To reinstall, follow instructions in reverse

order. Lubricate the shaft with a heavy duty, rust inhibitor multipurpose lubricant (example: LPS manufactured by LPS Laboratories). Take care not to get any of the lubricant on the RPM disc.

42.3 Flywheel replacement

Reinstall the flywheel axle (if required). Route the drive belt loosely around the flywheel drive belt grooves. Slide the flywheel axle into the holes in the frame. Reinstall the 3/4" nut onto the left side of the flywheel axle but do not tighten the nut all of the way. Mount the flywheel clamp plate onto the frame using the three Phillips head screws. Note: Align the shaft to the "D" shape of the flywheel clamp plate prior to installing the three screws. Route the drive belt around the drive wheel, idler pulley and flywheel. Perform the drive belt alignment procedure (see section 44). Reinstall the RPM sensor assembly and perform the RPM sensor alignment (see figure 16).

43. Friction belt replacement

Tools: #2 Phillips screwdriver
5/16" nut driver

The VR Bike friction belt is made from a combination of Nomex and Kevlar laminates. These are very tough, high temperature aramid fibers that exhibit very low wear under severe conditions. Pressure sensitive foam installed on the friction belt acts as a noise dampener. A slight friction noise during use is normal. Use a soft, dry cloth to remove any residue from the drive wheel. Install the new belt (for belt routing see figure 5). Once the new friction belt is installed, it is recommended you perform the calibration procedure (see section 10).

Note: Do not bend the belt in the opposite way from its natural curvature, as this may cause the layers to split.

43.1 Friction belt removal

Remove the brake assembly covers (see section 28). Using the 5/16" open end wrench, remove the screw and cone washer from the anchor point and from the motor pulley.

43.2 Friction belt replacement

Attach the rubber (urethane) leader to the motor pulley with the Kevlar side against the drive wheel surface, and the other end to the anchor using the cone washer and the 5/16" screw. It is important to fully tighten the screws at the anchor and the motor pulley. A loose screw may cause the belt to break.

44. Drive belt replacement

Tools: #2 phillips screwdriver
3/4" socket wrench
3/4" open end wrench

44.1 Drive belt replacement

Remove the brake assembly covers (see section 28). Remove the flywheel assembly (see section 42). Remove the friction belt (see section 43). Remove the old drive belt from the drive wheel and flywheel. Place new drive belt on grooves of flywheel. Route drive wheel belt from the flywheel grooves, over the idler pulley then over the drive wheel. Reinstall the flywheel (see section 42). Reinstall the friction belt (see section 43). Perform the drive wheel belt alignment procedure (see section 44.2, figure 8).

44.2 Drive belt alignment

The drive belt must be aligned properly or it will exhibit excessive wear. Remove the brake assembly covers (see section 28). Turn the pedals. The drive belt should be aligned on the drive wheel grooves and should not shift to either side (no shifting on the drive wheel, on the idler pulley or on the flywheel). If shifting does occur, check the drive belt tension. There should be no more than 1/2" of play (movement up/down). If there is more than 1/2" of play, adjustment of the drive belt tension is required. To adjust the drive belt tension, loosen the bottom 3/4" bolt and the top (pivot) 3/4" bolt on the idler arm assembly (see figure 6). Align the drive belt onto the grooves of the drive wheel and flywheel. Slide the idler arm to tighten the drive belt. Tighten the two 3/4" bolts. Turn the pedals. If shifting of the drive belt still occurs, the flywheel must be adjusted. To adjust the flywheel laterally, loosen the two 3/4" nuts on the flywheel axle (see figure 4). Align the drive belt onto the grooves of the drive wheel and flywheel. Turn the pedals while sliding the flywheel from side to side. Visually verify that the grooves on the flywheel line up with the grooves on the drive wheel. Alignment is correct when the drive belt does not shift off of the drive wheel, idler pulley and the flywheel. Tighten the 3/4" nuts.

45. RPM disc

Tools: #2 phillips head screwdriver
small flathead screwdriver

45.1 RPM disc replacement

The RPM Assembly is located on the drive wheel (see figure 3). Check the RPM disc for scratches or dents. If the RPM disc is scratched or dented, replace the disc. To remove the RPM disc, remove the right crank arm (see section 40). Use the #2 Phillips

screwdriver to remove the three screws (and spacers) holding the kick plate to the frame. Remove the screw securing the RPM sensor and move the RPM sensor and cable out of the way. Use the retaining ring pliers to remove the small retaining ring from the drive wheel shaft. Remove the washer and RPM disc from the drive wheel shaft. Remove washer from the RPM disc itself, and clean the washer with rubbing alcohol to remove any dirt or adhesive. Peel the adhesive from the new RPM disc. Remove the protective film from the disc. Take care not to scratch the new disc. Center the new disc on the washer, and press firmly to adhere. Reinstall the washer and retaining ring. Align the RPM sensor (see section 45.2).

45.2 RPM sensor alignment

Correct alignment of the RPM Assembly is critical to the proper operation of the VR Bike. Remove the right crank arm (see section 40). Use the #2 phillips screwdriver to remove the three screws (and spacers) holding the kick plate to the frame. The RPM sensor is attached to the RPM bracket and this bracket is secured to the frame (see figure 16). Align the RPM sensor over the RPM disc so that the RPM disc is centered in the middle of the RPM sensor and is as deep as possible into the sensor "slot" without actually touching the sensor (see figure 16). Vertical adjustment of the RPM sensor is accomplished by loosening the RPM sensor bracket mounting screw. Realign the bracket. Tighten the screw. Horizontal adjustment of the RPM sensor is accomplished by loosening the screw securing the RPM sensor to the bracket. Loosen this screw, adjust the sensor, and tighten. Reinstall the kick plate and the crank arm.

46. Monitor bezel

Tools: Phillips head screwdriver

Remove the two Phillips head screws on the bottom rear of the monitor bezel. Lift the monitor bezel up and off, but do not remove completely. Disconnect the monitor overlay from the overlay cable, and remove the bezel. To replace, repeat steps in reverse order.

47. Monitor back plate

Tools: Phillips head screwdriver

The monitor back plate is attached to the monitor cover by four Phillips head screws, and allows access to the CD-ROM drive. Remove the gray cover by sliding up and off. Remove the four Phillips head screws. The monitor adjustment controls are attached to the plate. These may be disconnected from the monitor at connector J-107 on the monitor PCB.

48. Wind tunnel

The wind tunnel for the fan is located just beneath the monitor. Remove the monitor bezel (see section 46). remove the plastic tube in front of the fan. The wind tunnel has flanges on the edges which fit into grooves on the monitor stand. Grasp the front of the wind tunnel and pull down and forward. The tunnel will slide right out of the grooves. To replace, repeat the steps in reverse order.

Parts replacement - Electrical

WARNING: The VR Bike has numerous electrical components, many of which have high current and/or voltage. Verify the bike is turned off at the switch plate before performing any of the following procedures.

49. Monitor

Tools: Phillips head screwdriver
3/16" socket

Remove the monitor bezel (see section 46) and the monitor back plate (see section 47). Disconnect the monitor adjustment controls, power input from the power supply, and the video cable (see figure 17).

Remove the four 3/16" nuts from the front of the monitor, and pull out from the front. To replace, repeat steps in reverse order.

50. Monitor overlay

Tools: Phillips head screwdriver
rubbing alcohol

Remove the monitor bezel (see section 46). gently peel up one corner of the overlay, and peel off. Clean the surface of the monitor bezel with rubbing alcohol to remove any residue or adhesive left from the old overlay. Peel off the backing on the new overlay, and press on to the monitor bezel. Make sure the overlay is aligned correctly. The adhesive is very sticky. Once the overlay makes contact, any attempt to peel up the overlay may result in damage to the overlay traces.

51. CD-ROM drive

Tools: Phillips head screwdriver

Remove the monitor back plate (see section 47). Disconnect all cables from the CD-ROM drive, and remove via the four Phillips head screws securing it to the frame. To replace, repeat the steps in reverse order.

52. CPU chassis (expansion cards)

Tools: Phillips head screwdriver

The CPU chassis is located in the monitor stand. It is comprised of a 486 motherboard, and expansion cards in ISA expansion slots on the motherboard. the motherboard has the following cards:

1. VGA card
2. Sound card
3. CP board

To remove any of the above listed expansion cards, please perform the following steps (see figure 7).

Remove the rear monitor stand cover (see section 29). Disconnect all connections from the expansion card. Note: be sure to check the orientation of the connections when plugging the connectors back into the card. Remove the small Phillips head screw securing the card to the CPU chassis. Lift out gently, making sure not to bend or twist the card. To replace, line up the edge card pins with the expansion slot. Press firmly but gently, so that the card is inserted fully into the slot. Reinstall the Phillips head screw. Reconnect the cables, and test. Replace the monitor stand cover.

To remove the motherboard, remove all the expansion cards. Disconnect all cables from the motherboard. Remove the two 1/4" nylon nuts at the top of the motherboard, and lift out. To replace, repeat the steps in reverse order.

53. Power supply

Tools: Phillips head screwdriver
5/16" nut driver

The power supply is located beneath the monitor. Remove the following components: Rear monitor stand cover, monitor bezel, wind tunnel and monitor back plate (see parts replacement, mechanical section). Disconnect all outputs and inputs from the power supply. Remove the four Phillips head screw securing the power supply to the frame. Two have nuts on the end of them. there are two in the front of the power supply, and two in back. Remove power supply. To replace, repeat the steps in reverse order.

54. Fan

Tools: 11/32" nut driver
11/32" open end wrench

Remove the monitor bezel (see section 46). Remove the wind tunnel (see section 48). Disconnect the two push on power leads form the fan. Remove the three 11/32" bolts and nuts and remove fan. To replace, repeat steps in reverse order. When installing fan, be sure to orient the direction of air flow properly. There is a small arrow on the side of the fan indicating air flow direction.

55. Switch plate assembly

Tools: #2 Phillips screwdriver

Remove the rear monitor stand cover (see section 29). Unplug the AC IN, ground and the communications (RS-232) connector from the switch plate assembly. Unscrew the two Phillips screws holding the switch plate bracket to the frame and remove the assembly.

To replace the assembly, follow the instructions in reverse order, taking care that the front of the switch plate is flush with the front of the frame.

56. Motor assembly

Tools: #2 Phillips screwdriver
socket wrench
3/8", 5/16", and 1/2" open end wrenches
5/32" Allen wrench

56.1 Motor assembly removal

Remove the brake assembly covers (see section 28). Disconnect all cables from the motor assembly. Using the 5/16" open end wrench, disconnect the friction belt from the motor pulley. Remove the 1/2" nut from the bolt holding the motor assembly to the frame. Slide the bolt from the motor assembly taking care to set aside the motor pivot tube, spring washer, motor stop plate, and motor pivot spacer, as they will be required for motor reassembly.

56.2 Motor assembly replacement

Replace the motor assembly in the reverse order of removal taking care to reinstall the motor pivot tube, spring washer, motor stop plate, and motor pivot spacer. Adjust the motor stop screw to a gap of .01" to .03". Connect the friction belt to the motor pulley. reconnect the cables to the motor assembly. It is recommended that the calibration procedure be performed whenever the motor assembly is replaced (see section 13).

57. Tilt sensor

Tools: 7/16" open end wrench

The tilt sensor is located just beneath the CPU chassis. remove the rear monitor stand cover (see section 29). Disconnect the sensor cable form J3 on the CP board. remove the 7/16" nut holding the bracket to the frame, and remove sensor. To replace, repeat steps in reverse order. Please see figure 16 for sensor alignment and adjustment.

58. IC board

Tools: Phillips head screwdriver

The interconnect board is located underneath the seat. Remove the seat bottom (see section 30). Disconnect all cables from the IC board. Remove the board via the four Phillips head screws. Repeat in reverse order to replace.

59. Hand grip switches

Tools: Phillips head screwdriver
1/2" socket
rubbing alcohol

Remove the seat bottom (see section 30). Disconnect the hand grip switches from the IC board under the seat bottom (left switch- connector J4, right switch- connector J5). Pull off the hand grips (see figure 13). Remove the four Phillips head screws from the handle grip plug. Pull slowly on the plug, while simultaneously feeding the cable through the handlebar. **Note:** The switch key pad and the switch cable are connected. Use caution when pulling the plug out, or the cable may come disconnected with the connector still inside the handlebar. Leave two or three inches of cable exposed outside the handlebars. Remove the grip key pad from the handle grip plug. Clean the surface with rubbing alcohol. Remove the backing from the adhesive on the new key pad, and install onto the plug by inserting the connector end through the plug. Align the switches on

the flat of the handle grip plug, and press firmly. Reconnect the key pad to the switch cable. Slide the handle grip plug over the handlebar while gently pulling on the opposite end of the switch cable to take up slack. Align the plug so the holes in the handlebar line up, and replace the four Phillips head screws. Replace the hand grips, reconnect the switches to the IC board, and test. Reinstall the seat bottom.

60. Heart rate receiver

Tools: Diagonal cutters
Cable ties

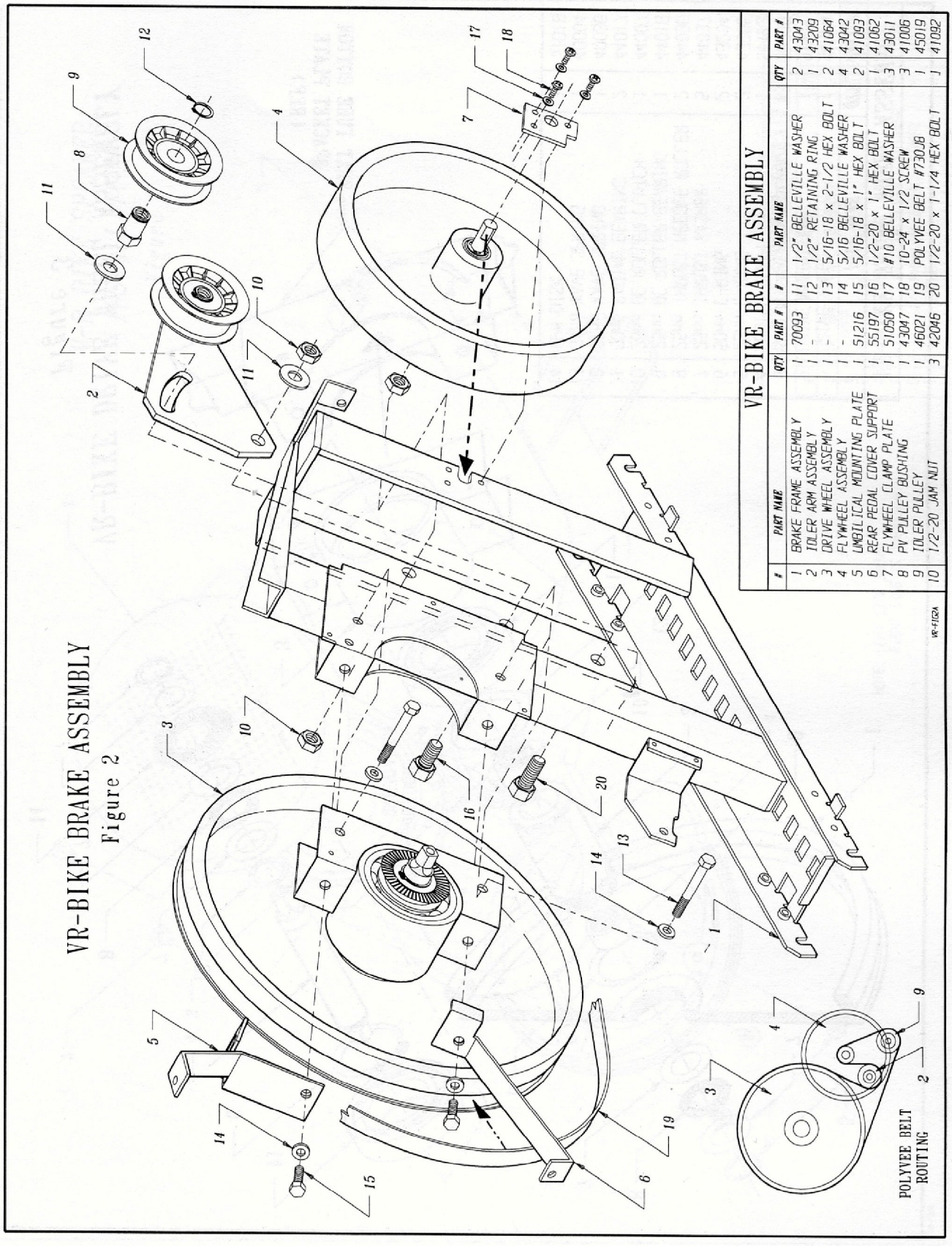
The heart rate receiver chip is located just beneath the seat, on the left side of the swing arm. It is secured via a hook-and-eye system similar to Velcro. To install or replace the heart rate receiver, please perform the following steps. remove the seat covers (see section 27). Disconnect the heart rate cable from connector J6 (also labeled "h-rate") on the IC board. Cut the cable ties, and gently peel of the chip from the frame. To replace repeat steps in reverse order. Reinstall cable ties and seat covers.

61. Speakers

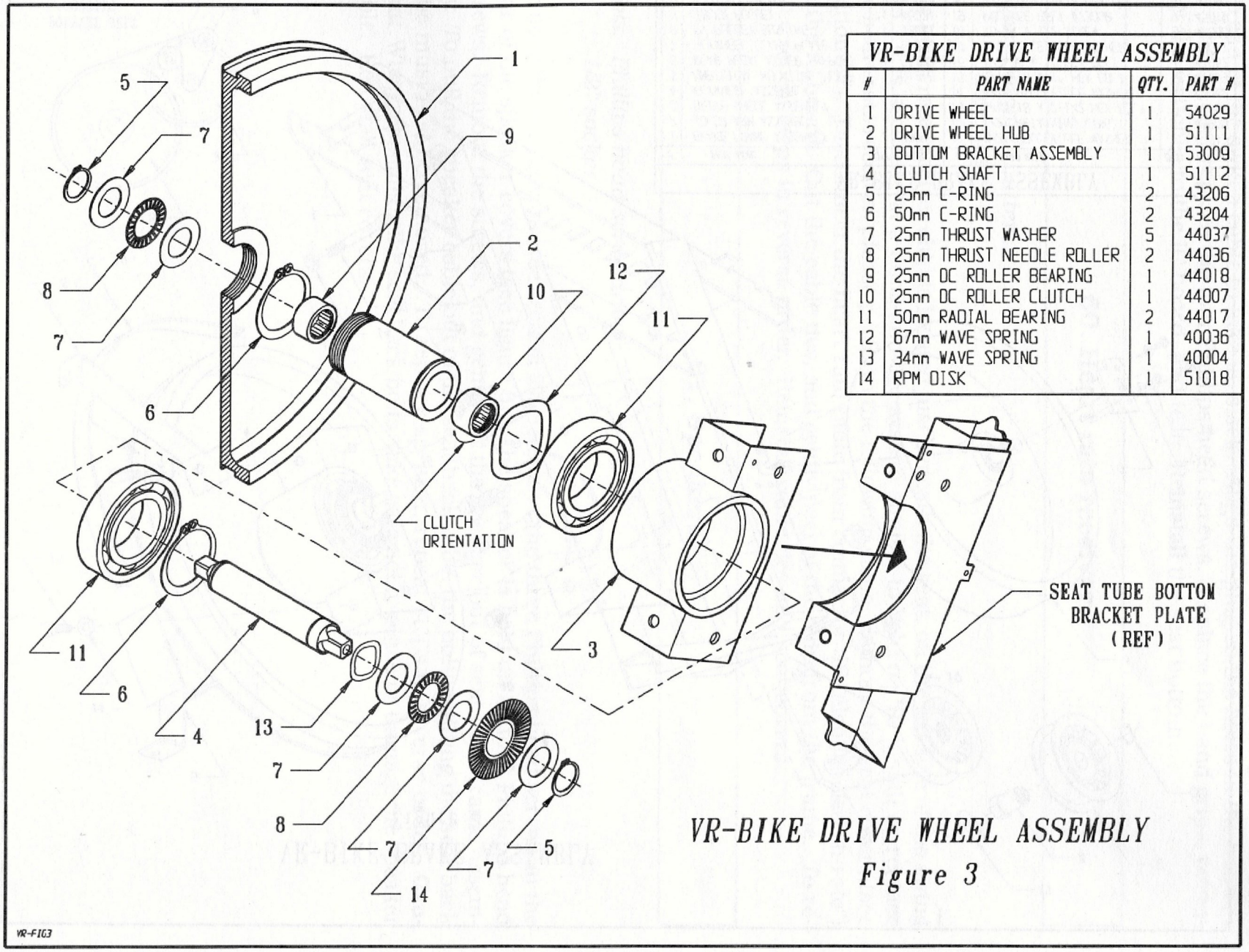
Tools: Phillips head screwdriver
1/2" socket

Remove the seat covers (see section 27). Remove the three Phillips head screws in the rear of the speaker covers (see figure 6). The speaker is held on by four Phillips head screws. Remove the screws, and gently lift the speaker out of seat back frame assembly. To pull the speaker cable out of the seat back tube, the bolts holding the seat back tube must first be removed. To replace speaker, repeat steps in reverse order. **Caution:** When reinstalling the seat back bolts, take care not to pinch or damage the speaker cable. Reinstall seat covers.

Figures



#	PART NAME	QTY	PART #	#	PART NAME	QTY	PART #
1	BRAKE FRAME ASSEMBLY	1	70093	11	1/2" BELLEVILLE WASHER	2	43043
2	IDLER ARM ASSEMBLY	1	-	12	1/2" RETAINING RING	1	43209
3	DRIVE WHEEL ASSEMBLY	1	-	13	5/16-18 x 2-1/2 HEX BOLT	2	41064
4	FLYWHEEL ASSEMBLY	1	-	14	5/16 BELLEVILLE WASHER	4	43042
5	UMBILICAL MOUNTING PLATE	1	51216	15	5/16-18 x 1" HEX BOLT	2	41093
6	REAR PEDAL COVER SUPPORT	1	55197	16	1/2-20 x 1" HEX BOLT	1	41062
7	FLYWHEEL CLAMP PLATE	1	51050	17	#10 BELLEVILLE WASHER	3	43011
8	PV PULLEY BUSHING	1	43047	18	10-24 x 1/2 SCREW	3	41006
9	IDLER PULLEY	1	46021	19	POLYVEE BELT #730J8	1	45019
10	1/2-20 JAM NUT	3	42046	20	1/2-20 x 1-1/4 HEX BOLT	1	41092



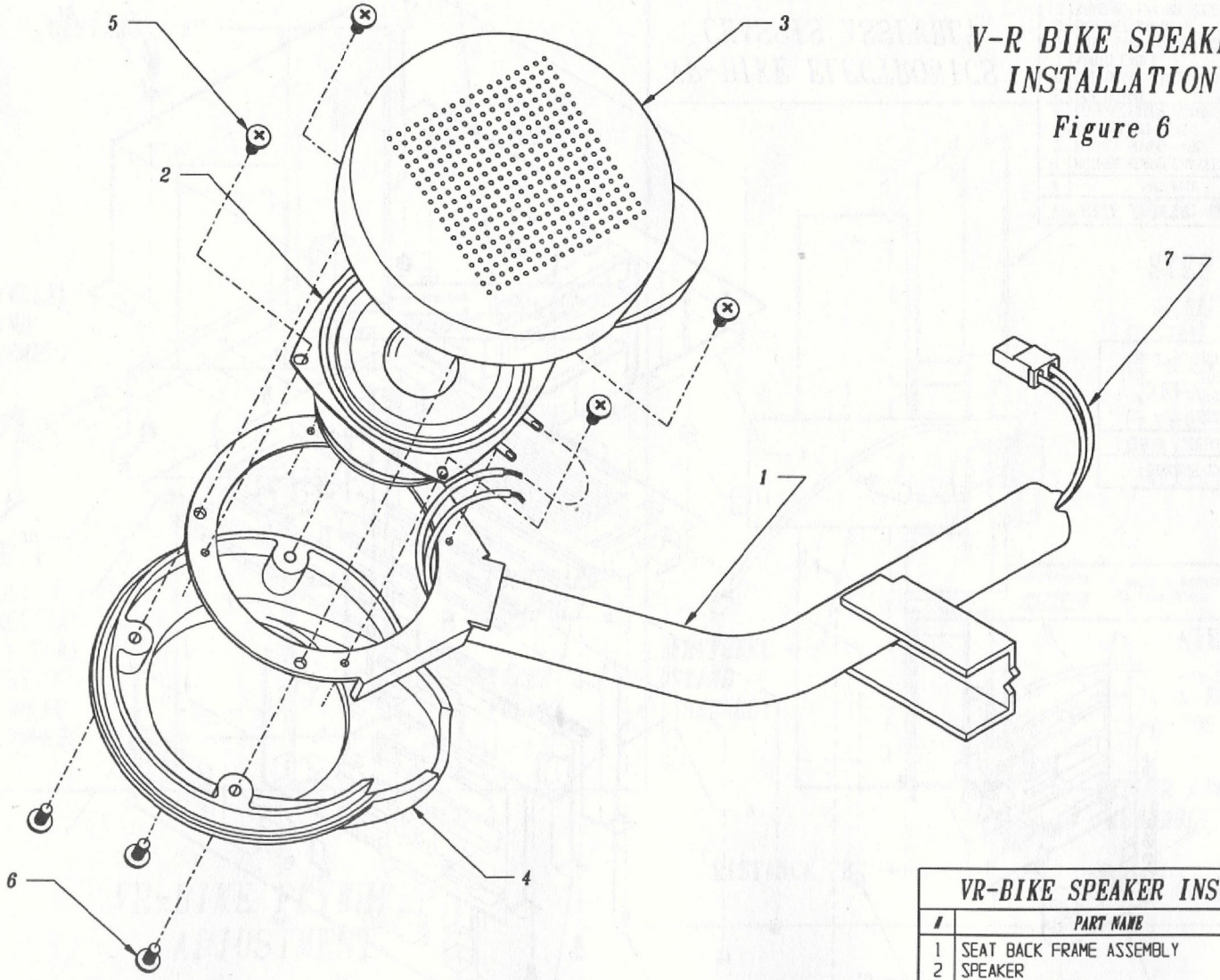
VR-BIKE DRIVE WHEEL ASSEMBLY			
#	PART NAME	QTY.	PART #
1	DRIVE WHEEL	1	54029
2	DRIVE WHEEL HUB	1	51111
3	BOTTOM BRACKET ASSEMBLY	1	53009
4	CLUTCH SHAFT	1	51112
5	25nn C-RING	2	43206
6	50nn C-RING	2	43204
7	25nn THRUST WASHER	5	44037
8	25nn THRUST NEEDLE ROLLER	2	44036
9	25nn DC ROLLER BEARING	1	44018
10	25nn DC ROLLER CLUTCH	1	44007
11	50nn RADIAL BEARING	2	44017
12	67nn WAVE SPRING	1	40036
13	34nn WAVE SPRING	1	40004
14	RPM DISK	1	51018

VR-BIKE DRIVE WHEEL ASSEMBLY

Figure 3

V-R BIKE SPEAKER INSTALLATION

Figure 6

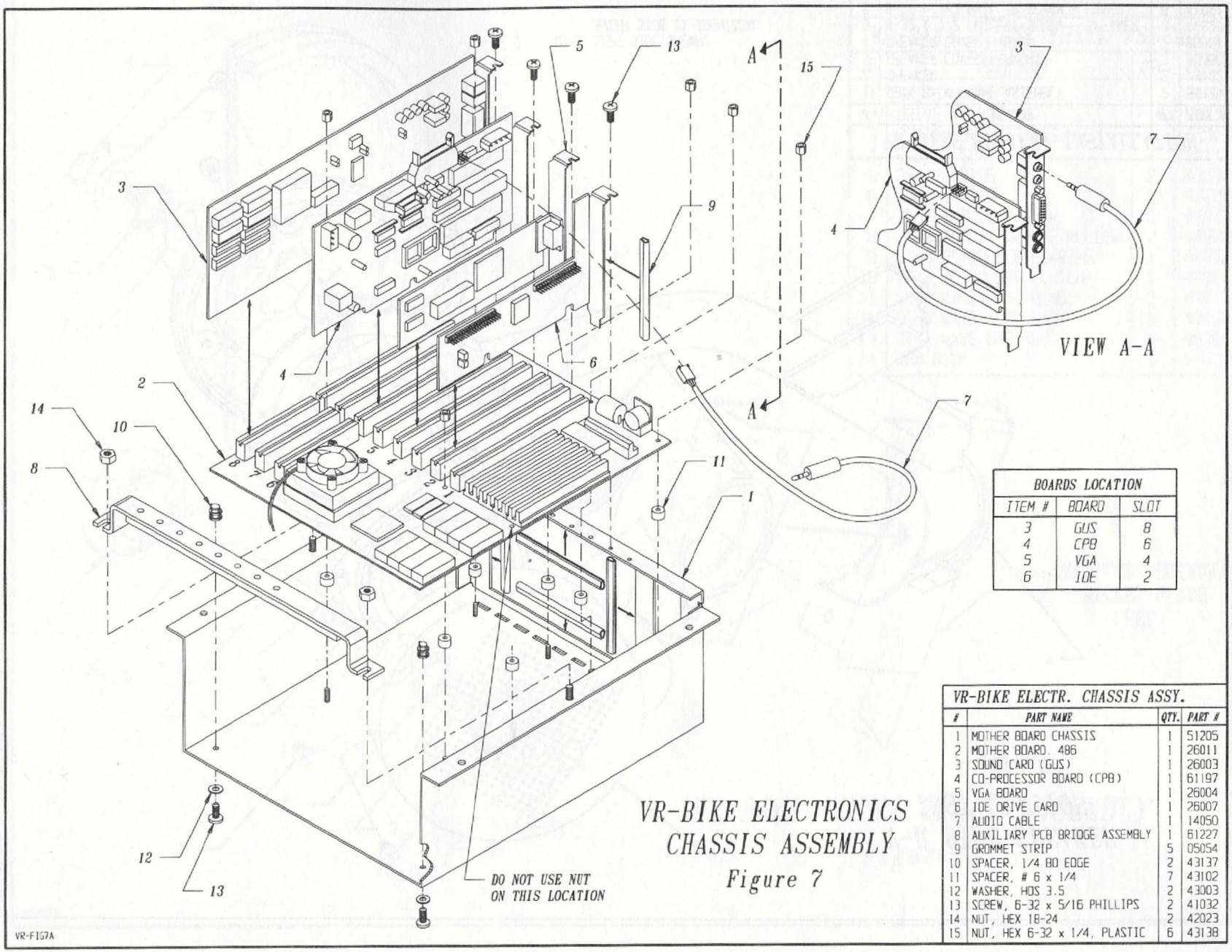


NOTE: LEFT SIDE SHOWN.
RIGHT SIDE IS IDENTICAL

VR-FIG6

VR-BIKE SPEAKER INSTALLATION

#	PART NAME	QTY.	PART #
1	SEAT BACK FRAME ASSEMBLY	2	51187
2	SPEAKER	2	13102
3	SPEAKER COVER - FRONT	2	05050
4	SPEAKER COVER - BACK	2	05051
5	8-32 x 1/2 PHILLIP SCREW - SPEAKER	8	41027
6	8-32 x 1/2 PHILLIP SCREW - COVER	6	41091
7	SPEAKER CABLE	2	14056



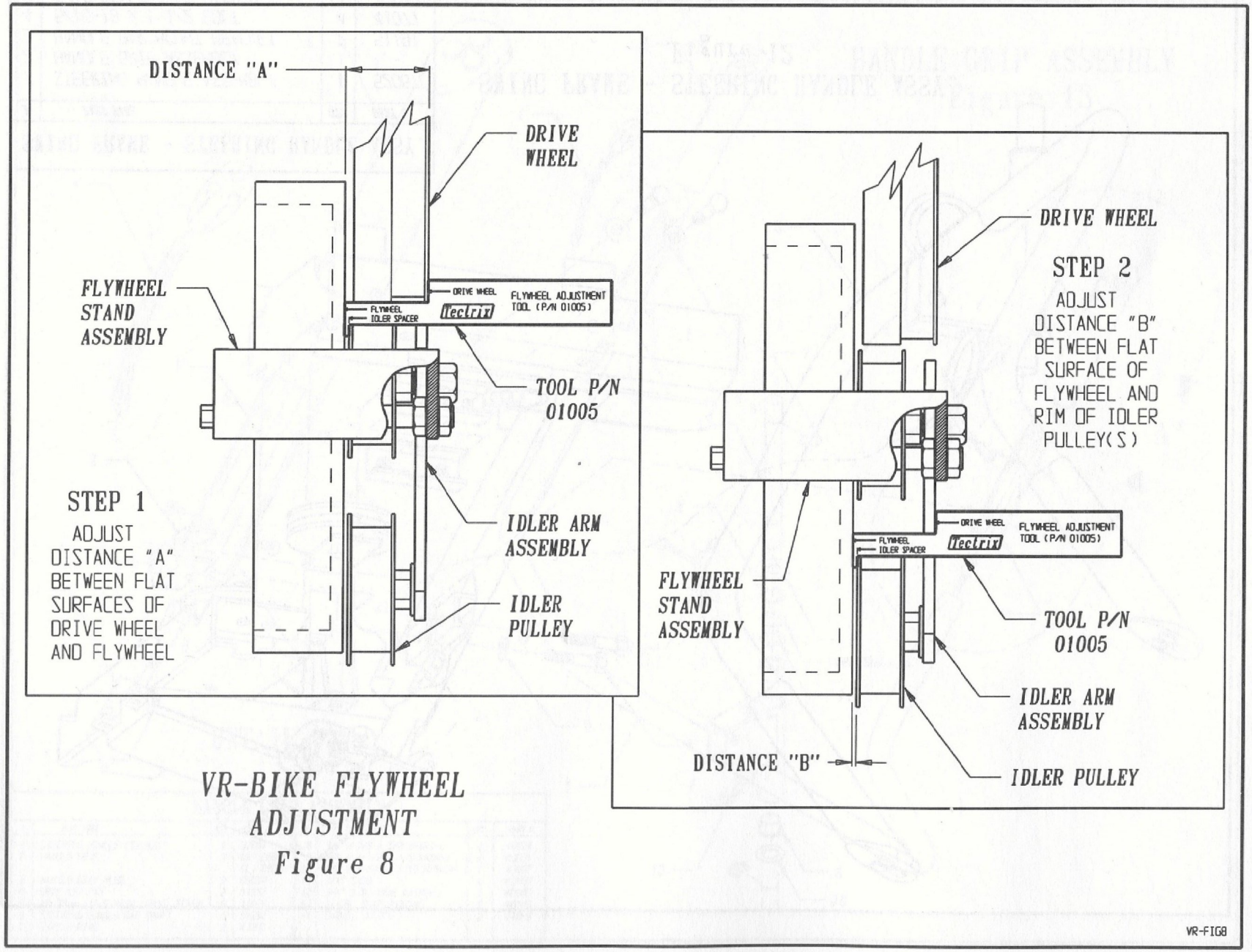
BOARDS LOCATION		
ITEM #	BOARD	SLOT
3	GUS	8
4	CPB	6
5	VGA	4
6	IDE	2

VR-BIKE ELECTRONICS CHASSIS ASSEMBLY

Figure 7

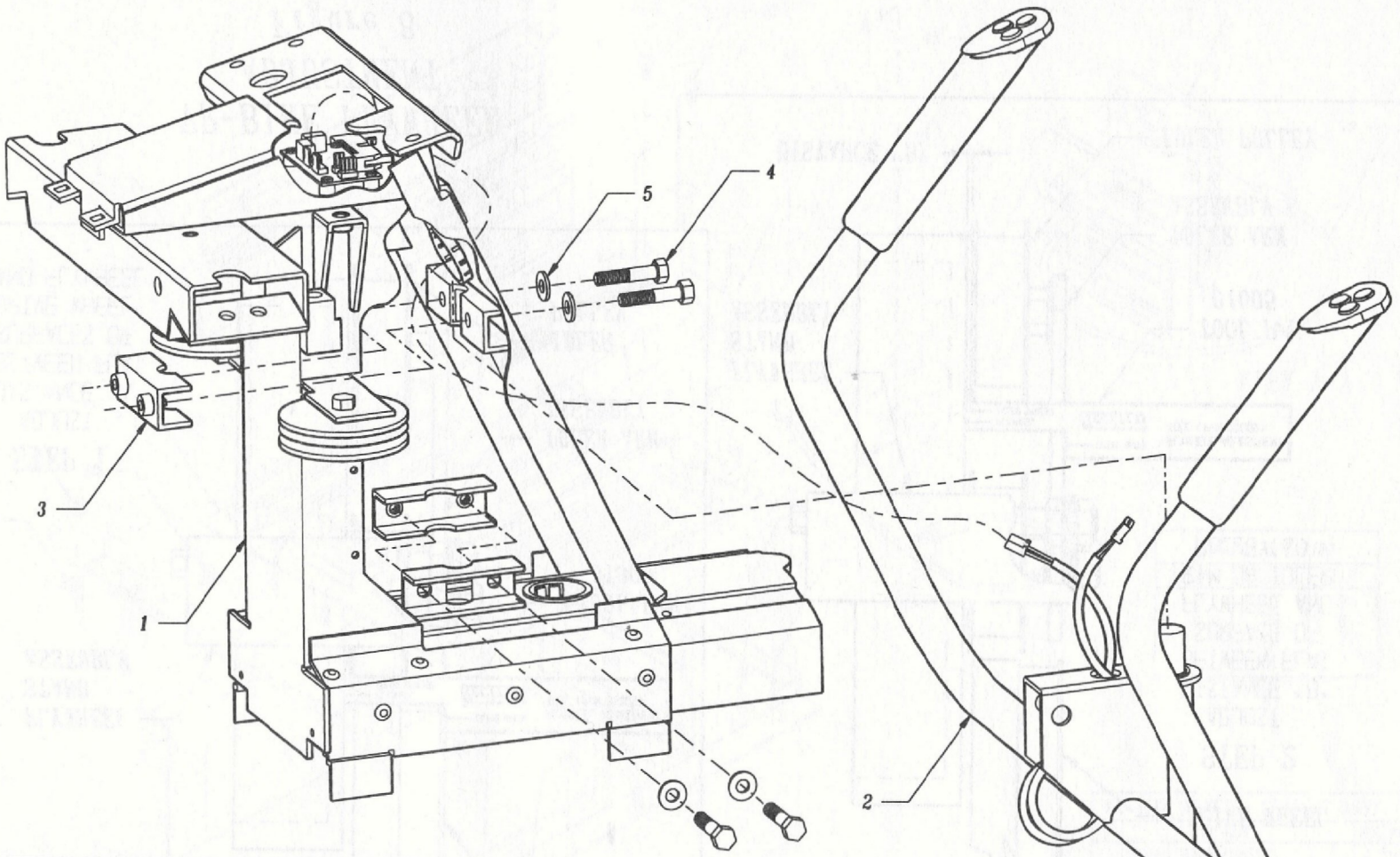
VR-FIG7A

VR-BIKE ELECTR. CHASSIS ASSY.			
#	PART NAME	QTY.	PART #
1	MOTHER BOARD CHASSIS	1	51205
2	MOTHER BOARD. 486	1	26011
3	SOUND CARD (GUS)	1	26003
4	CO-PROCESSOR BOARD (CPB)	1	61197
5	VGA BOARD	1	26004
6	IDE DRIVE CARD	1	26007
7	AUDIO CABLE	1	14050
8	AUXILIARY PCB BRIDGE ASSEMBLY	1	61227
9	GROMMET STRIP	5	05054
10	SPACER, 1/4 BD EDGE	2	43137
11	SPACER, # 6 x 1/4	7	43102
12	WASHER, HDS 3.5	2	43003
13	SCREW, 6-32 x 5/16 PHILLIPS	2	41032
14	NUT, HEX 18-24	2	42023
15	NUT, HEX 6-32 x 1/4, PLASTIC	6	43138



VR-BIKE FLYWHEEL ADJUSTMENT

Figure 8



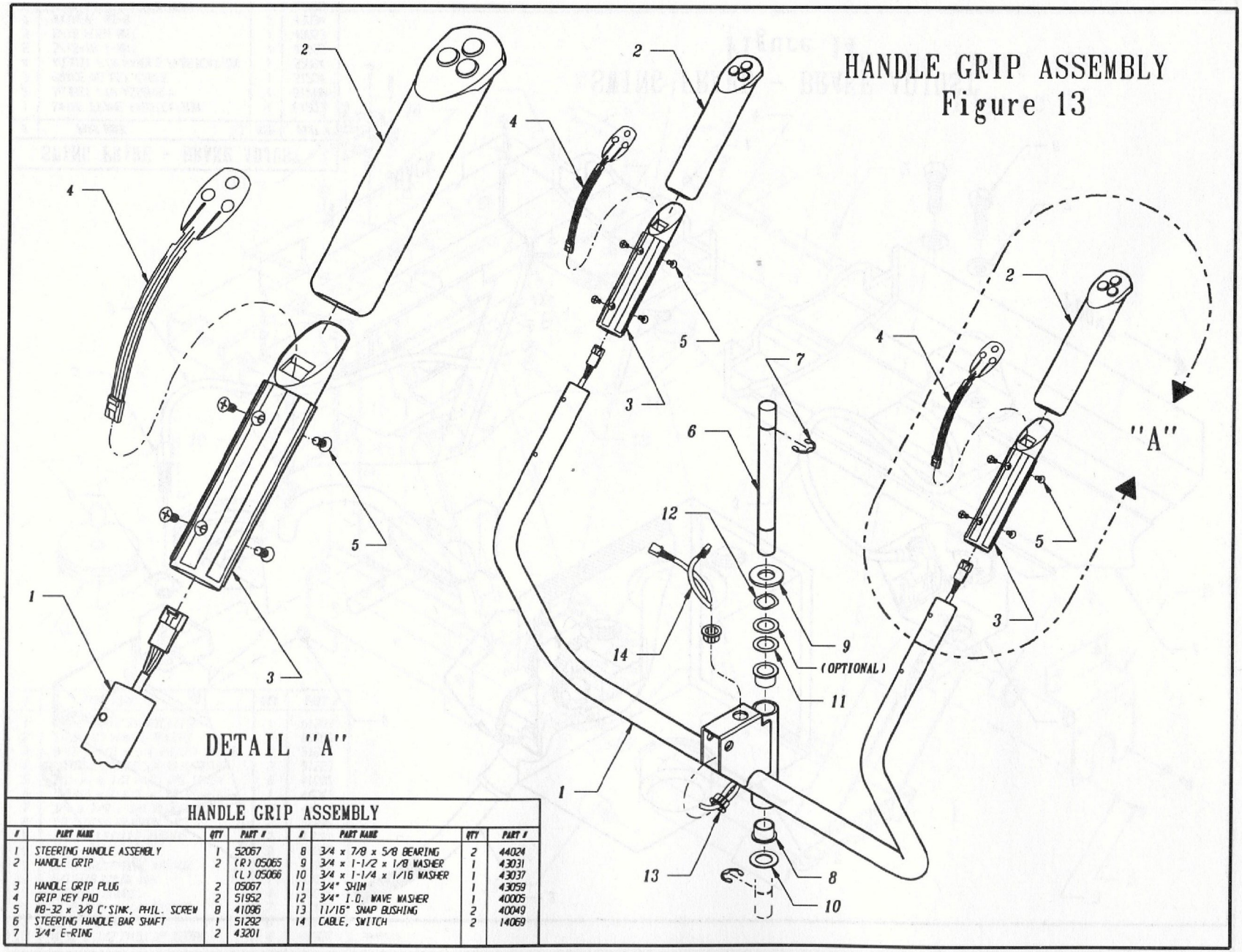
SWING FRAME - STEERING HANDLE ASSY.

#	PART NAME	QTY	PART #
1	STEERING HANDLE ASSEMBLY	1	52067
2	HANDLE GRIP ASSEMBLY	1	-
3	HANDLE BAR MOUNT BRACKET	2	51191
4	5/16-18 x 1-1/2 BOLT	4	41077
5	5/16 BELLEVILLE WASHER	4	43042

SWING FRAME - STEERING HANDLE ASSY.
Figure 12

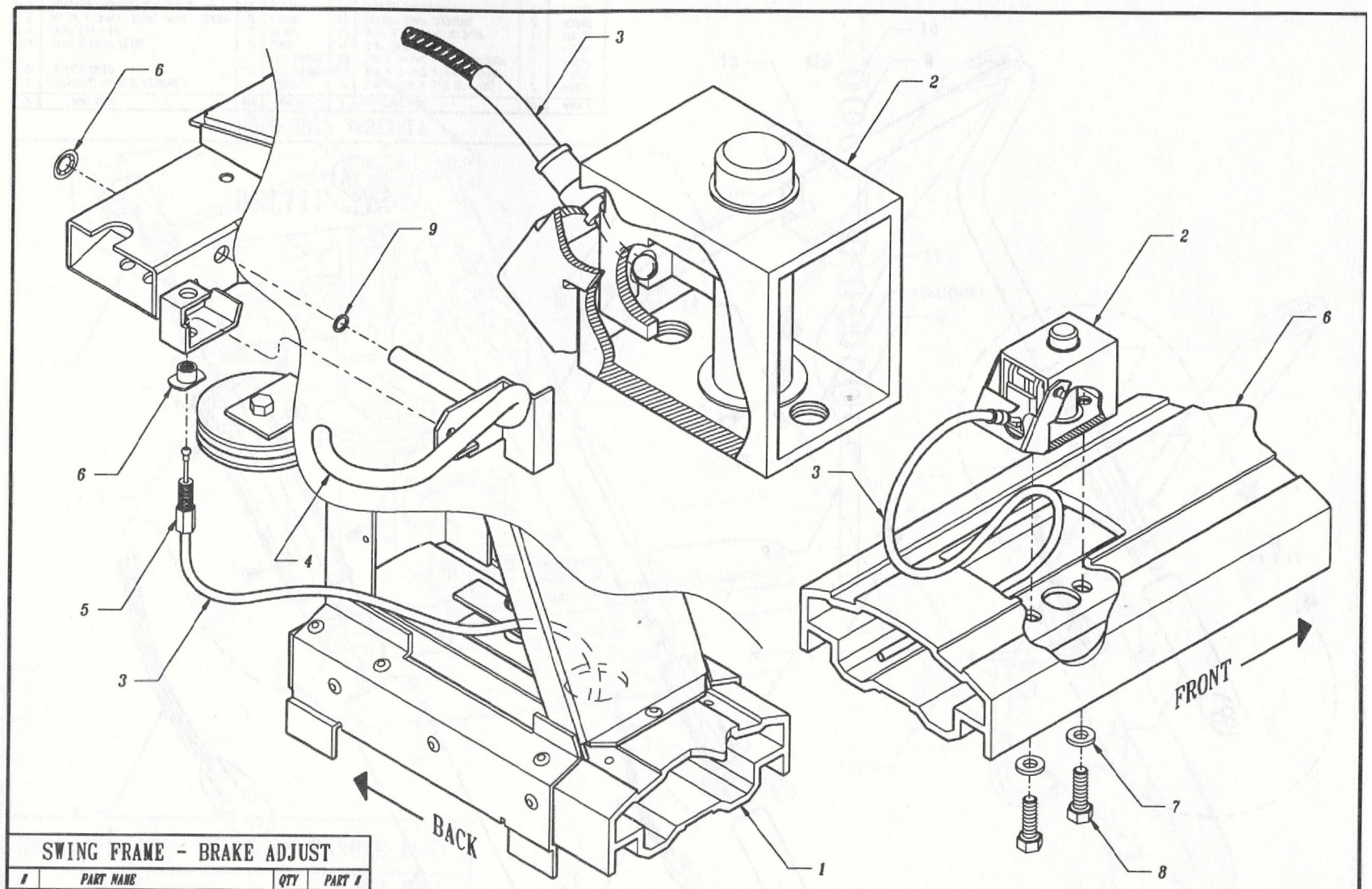
VR-FIG12

HANDLE GRIP ASSEMBLY
Figure 13



HANDLE GRIP ASSEMBLY

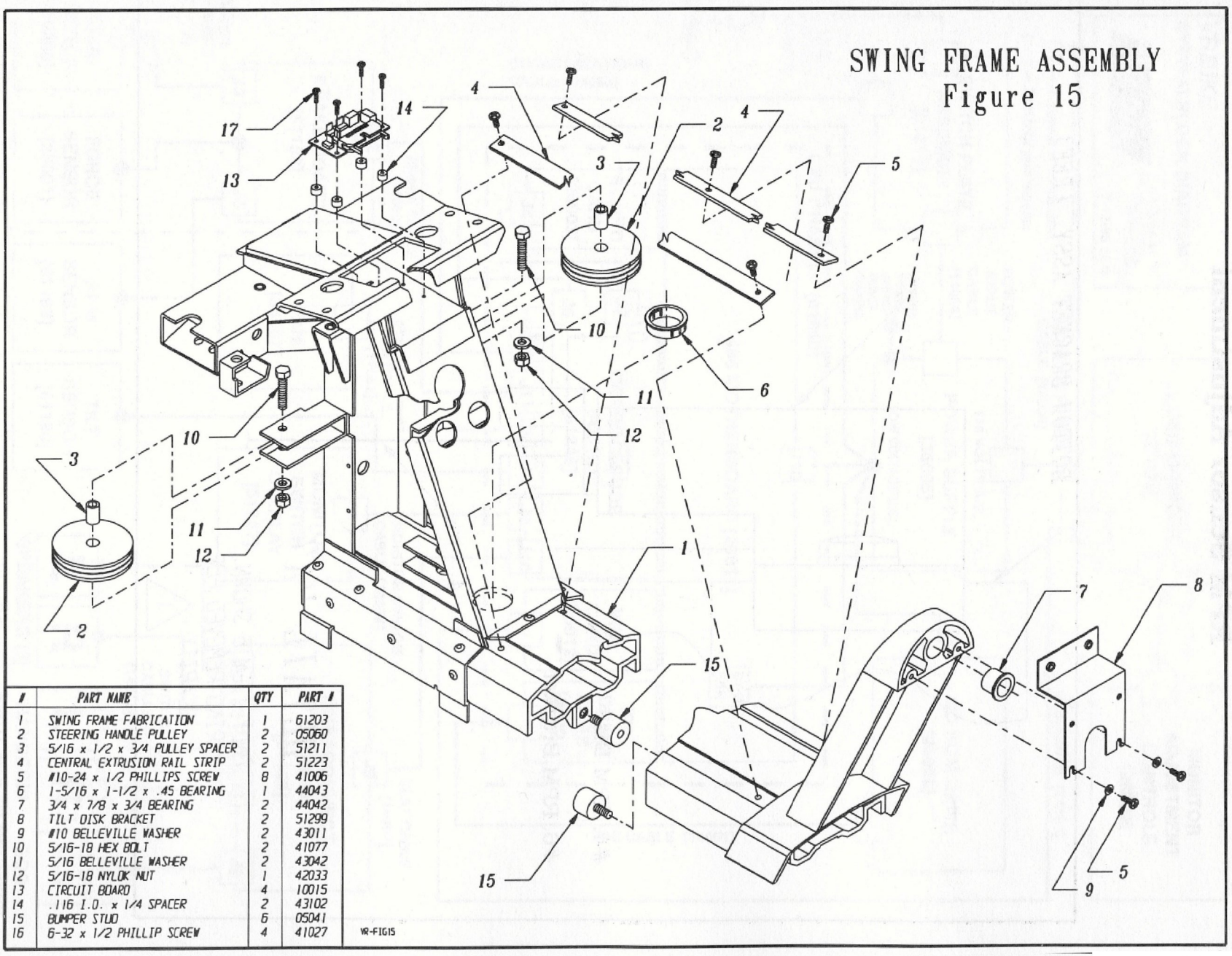
#	PART NAME	QTY	PART #	#	PART NAME	QTY	PART #
1	STEERING HANDLE ASSEMBLY	1	52067	8	3/4 x 7/8 x 5/8 BEARING	2	44024
2	HANDLE GRIP	2	(R) 05065	9	3/4 x 1-1/2 x 1/8 WASHER	1	43031
			(L) 05066	10	3/4 x 1-1/4 x 1/16 WASHER	1	43037
3	HANDLE GRIP PLUG	2	05067	11	3/4" SHIM	1	43059
4	GRIP KEY PAD	2	51952	12	3/4" I.D. WAVE WASHER	1	40005
5	#8-32 x 3/8 C'SINK, PHIL. SCREW	8	41096	13	11/16" SNAP BUSHING	2	40049
6	STEERING HANDLE BAR SHAFT	1	51292	14	CABLE, SWITCH	2	14069
7	3/4" E-RING	2	43201				



SWING FRAME - BRAKE ADJUST			
#	PART NAME	QTY	PART #
1	SWING FRAME FABRICATION	1	61203
2	ADJUST PIN ASSEMBLY	1	61210
3	BRAKE ADJUST CABLE	1	51204
4	ADJUST PIN HANDLE FABRICATION	1	52054
5	5/16-18 T-NUT	1	42055
6	5/16 PUSH NUT	1	42053
7	WASHER, VS-8	2	43034
8	5/16-18 x 3/4 HEX BOLT	2	41076
9	WASHER, .321 x 7/16 x .040	1	43057

SWING FRAME - BRAKE ADJUST
Figure 14

SWING FRAME ASSEMBLY
Figure 15



#	PART NAME	QTY	PART #
1	SWING FRAME FABRICATION	1	61203
2	STEERING HANDLE PULLEY	2	05060
3	5/16 x 1/2 x 3/4 PULLEY SPACER	2	51211
4	CENTRAL EXTRUSION RAIL STRIP	2	51223
5	#10-24 x 1/2 PHILLIPS SCREW	8	41006
6	1-5/16 x 1-1/2 x .45 BEARING	1	44043
7	3/4 x 7/8 x 3/4 BEARING	2	44042
8	TILT DISK BRACKET	2	51299
9	#10 BELLEVILLE WASHER	2	43011
10	5/16-18 HEX BOLT	2	41077
11	5/16 BELLEVILLE WASHER	2	43042
12	5/16-18 NYLOK NUT	1	42033
13	CIRCUIT BOARD	4	10015
14	.116 I.D. x 1/4 SPACER	2	43102
15	BUMPER STUD	6	05041
16	6-32 x 1/2 PHILLIP SCREW	4	41027

YR-FIG15

Figure 16

RPM Sensor Adjustment

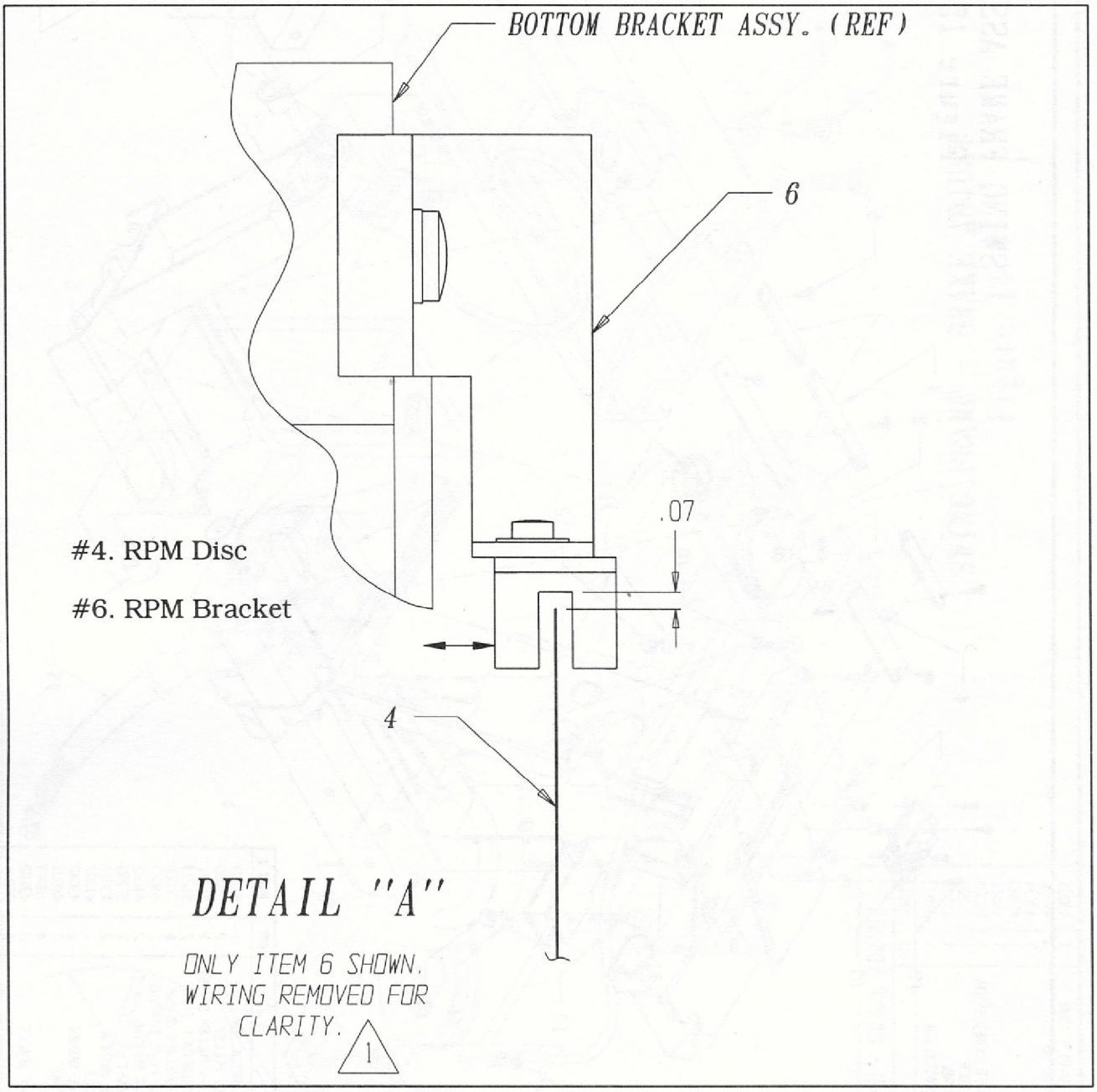
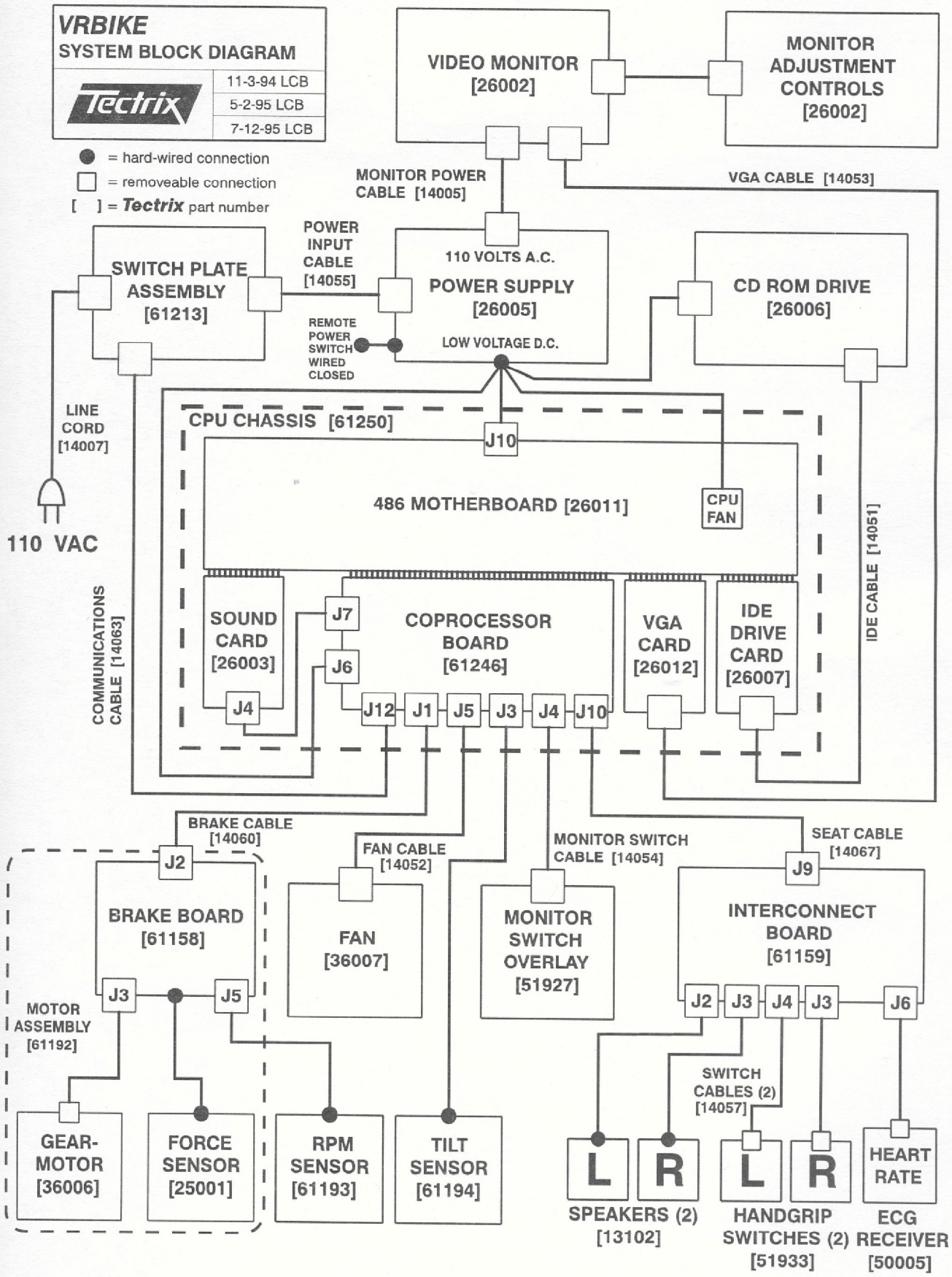


Figure 17


VRBIKE
SYSTEM BLOCK DIAGRAM
Tectrix
11-3-94 LCB
5-2-95 LCB
7-12-95 LCB
= hard-wired connection
= removeable connection
[ ] = Tectrix part number
VIDEO MONITOR [26002]
MONITOR ADJUSTMENT CONTROLS [26002]
MONITOR POWER CABLE [14005]
VGA CABLE [14053]
POWER INPUT CABLE [14055]
110 VOLTS A.C.
POWER SUPPLY [26005]
SWITCH PLATE ASSEMBLY [61213]
CD ROM DRIVE [26006]
REMOTE POWER SWITCH WIRED CLOSED
LOW VOLTAGE D.C.
LINE CORD [14007]
110 VAC
CPU CHASSIS [61250]
J10
486 MOTHERBOARD [26011]
CPU FAN
IDE CABLE [14051]
COMMUNICATIONS CABLE [14063]
SOUND CARD [26003]
J7
J6
J4
COPROCESSOR BOARD [61246]
J12
J1
J5
J3
J4
J10
VGA CARD [26012]
IDE DRIVE CARD [26007]
BRAKE CABLE [14060]
FAN CABLE [14052]
MONITOR SWITCH CABLE [14054]
SEAT CABLE [14067]
J2
BRAKE BOARD [61158]
J3
J5
MOTOR ASSEMBLY [61192]
FAN [36007]
MONITOR SWITCH OVERLAY [51927]
J9
INTERCONNECT BOARD [61159]
J2
J3
J4
J3
J6
SWITCH CABLES (2) [14057]
GEAR-MOTOR [36006]
FORCE SENSOR [25001]
RPM SENSOR [61193]
TILT SENSOR [61194]
L
R
L
R
HEART RATE
SPEAKERS (2) [13102]
HANDGRIP SWITCHES (2) [51933]
ECG RECEIVER [50005]

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