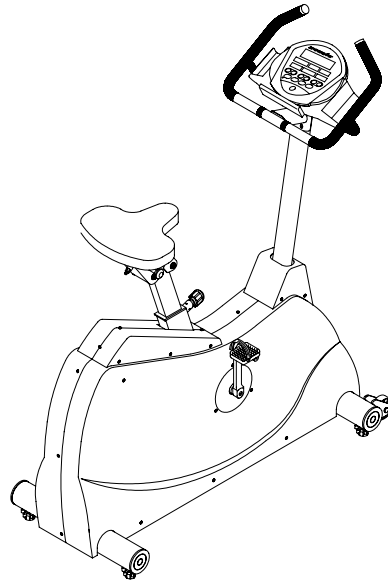


# SPORTSART

## 5100/5150/5200 Bicycle Troubleshooting Manual



Version 2; Date: 10-25-04

## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### **5100/5150/5200 Bicycle Troubleshooting Manual**

This manual was designed as a troubleshooting guide for technicians in the field. If you have suggestions or comments, please contact Bob Baumgartner at [bob@sportsartamerica.com](mailto:bob@sportsartamerica.com). Thank you!

Version 1: June 11, 2002

Version 2: Oct. 25, 2004 – Updated to include 5150.

#### **Note on Design Changes:**

The 5100 and 5150 are very similar. The 5150 was a revision of the 5100. The revision was made in the spring of 2002 mainly for aesthetic reasons. The 5100 had legs that extended in back from a round, plastic case. These legs and the case, shown on page 1-1-1, were eliminated on 5150, and the drive board and battery were placed under the main covers. The rear feet on the 5150 extend from a tube like that shown on the 5200 on page 1-1-2. The 5100 and 5150 displays also differ in appearance. Functions, except for minor program modifications, are the same.

In the summer of 2003, the 5150 and 5200 displays were changed. Models with the new displays were called C5150 and C5200 to match the new C-series bikes. Program operation differs from earlier models because the display key layout changed considerably.

# SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

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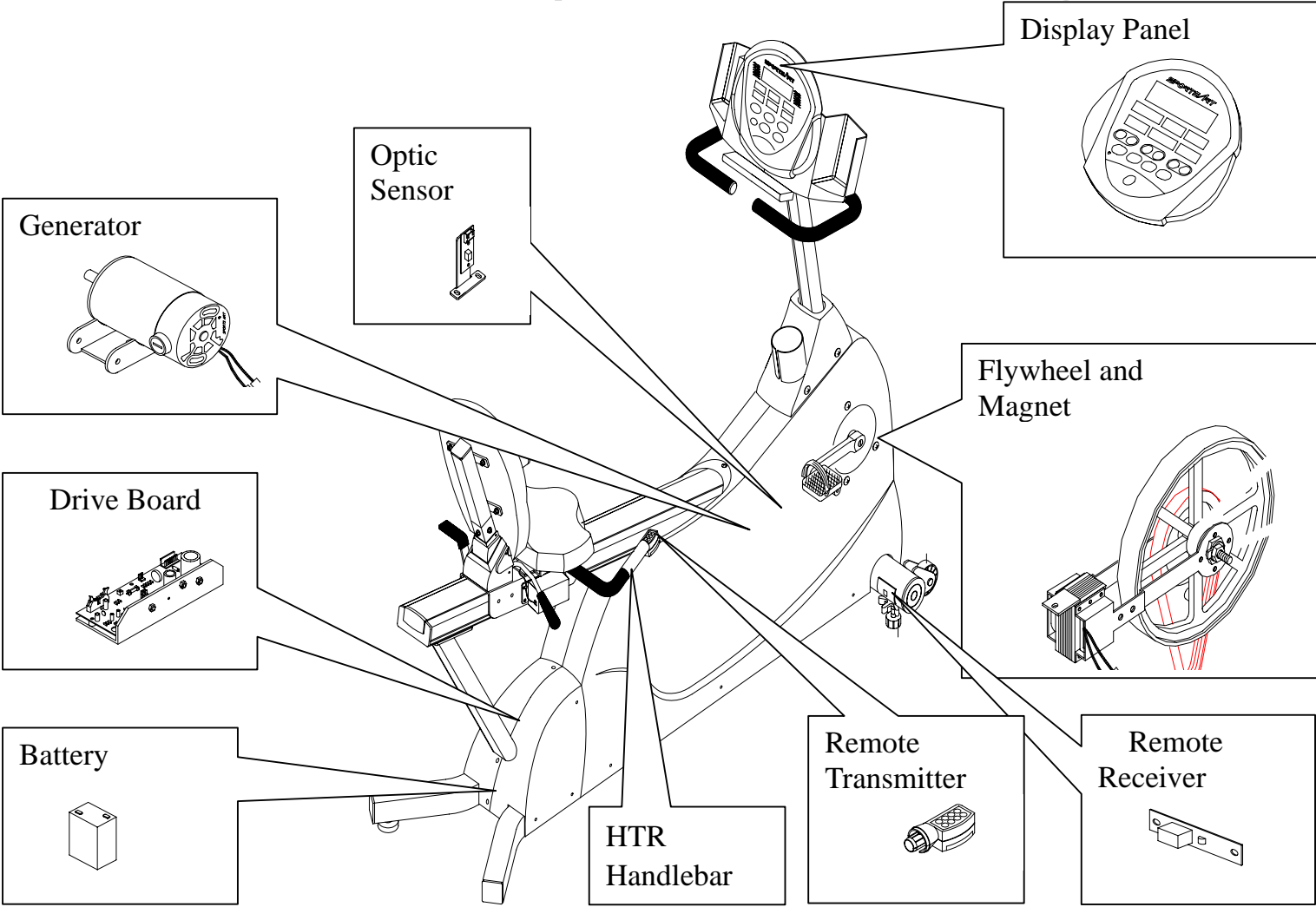
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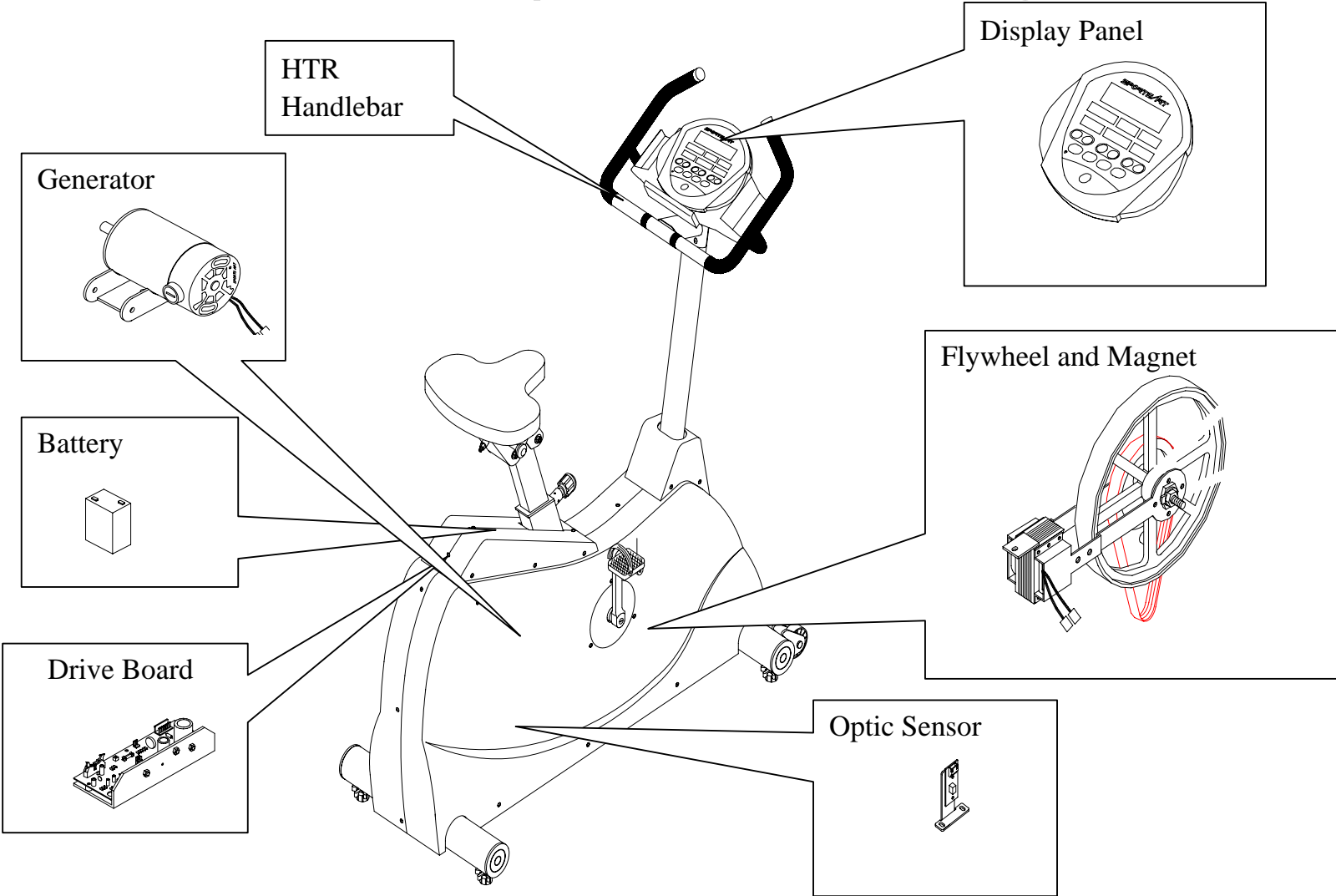
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## **Chapter I. Basic Configuration Diagrams**

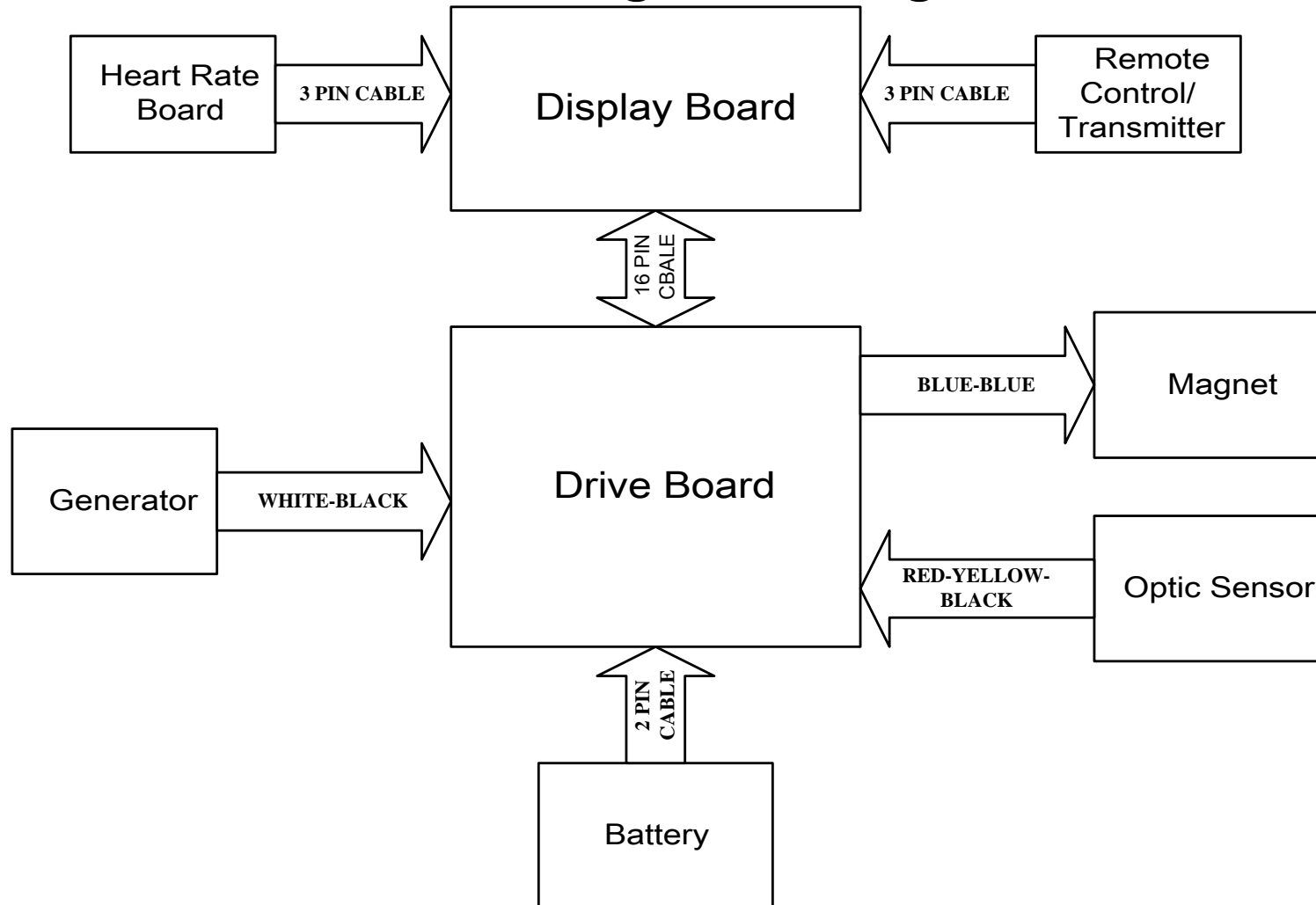
# 5100 Bicycle Electronic Component Placement Diagram



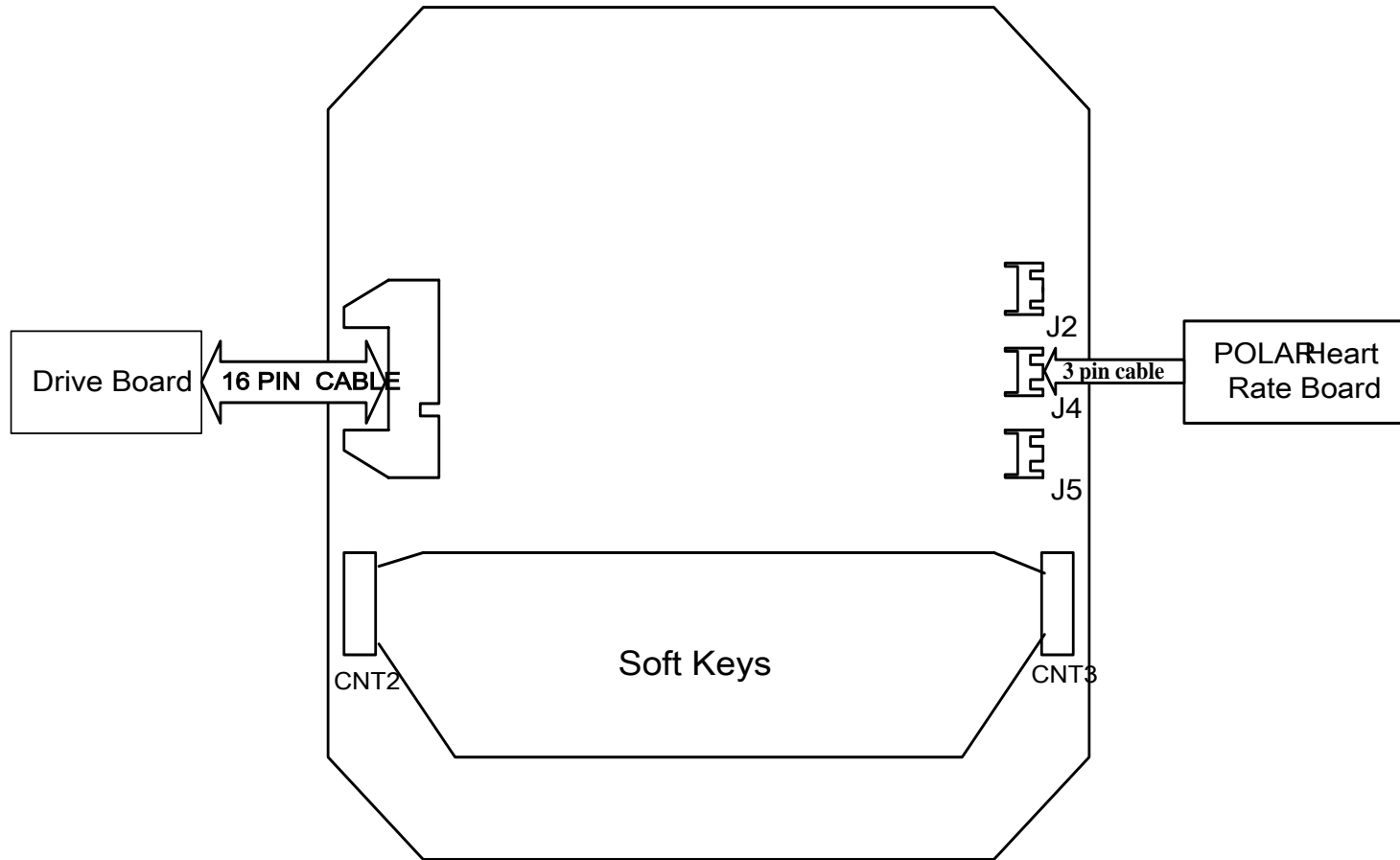
# 5200 Bicycle Electronic Component Placement Diagram



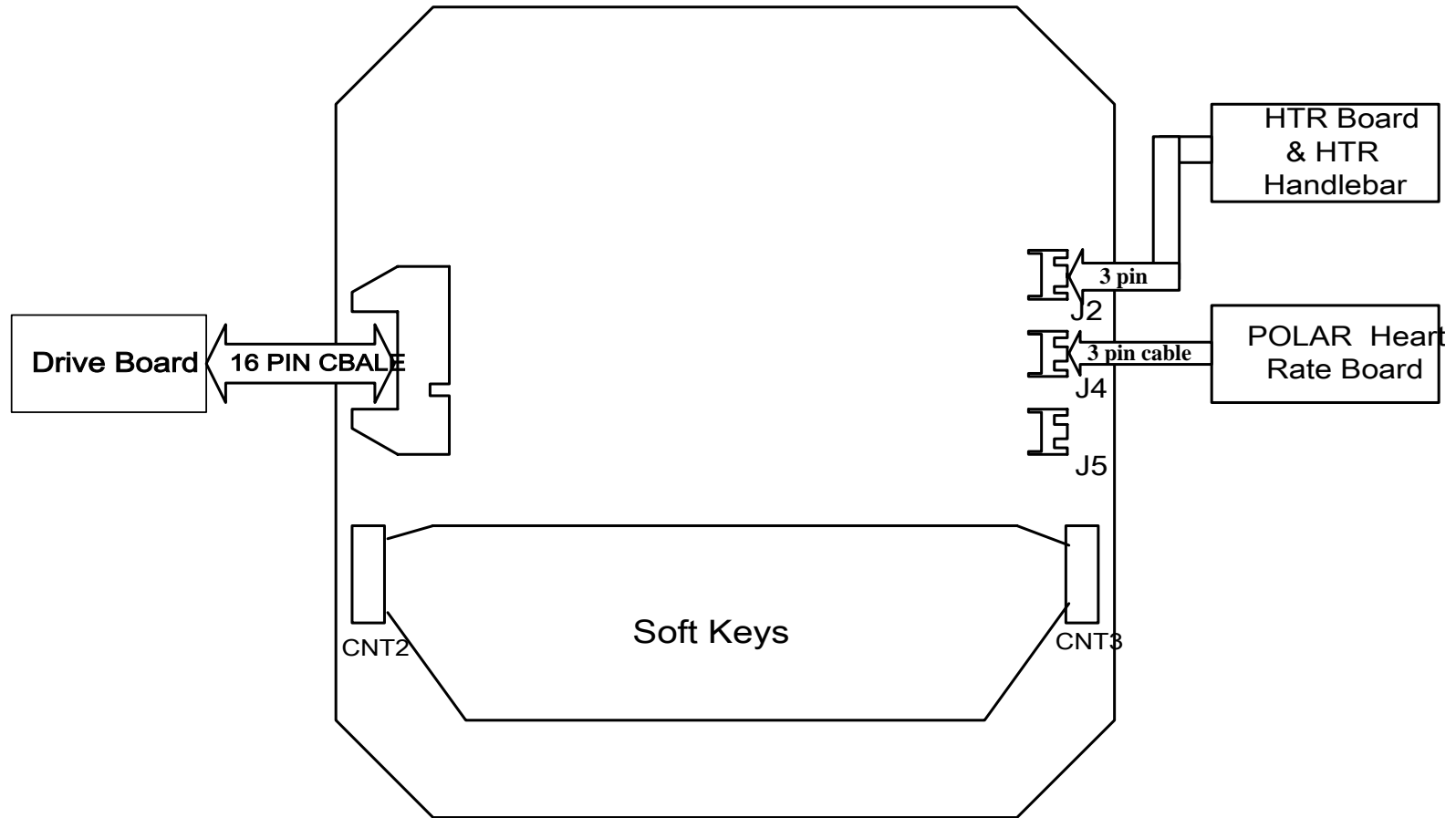
### 5100/5150/5200 Basic Configuration Diagram



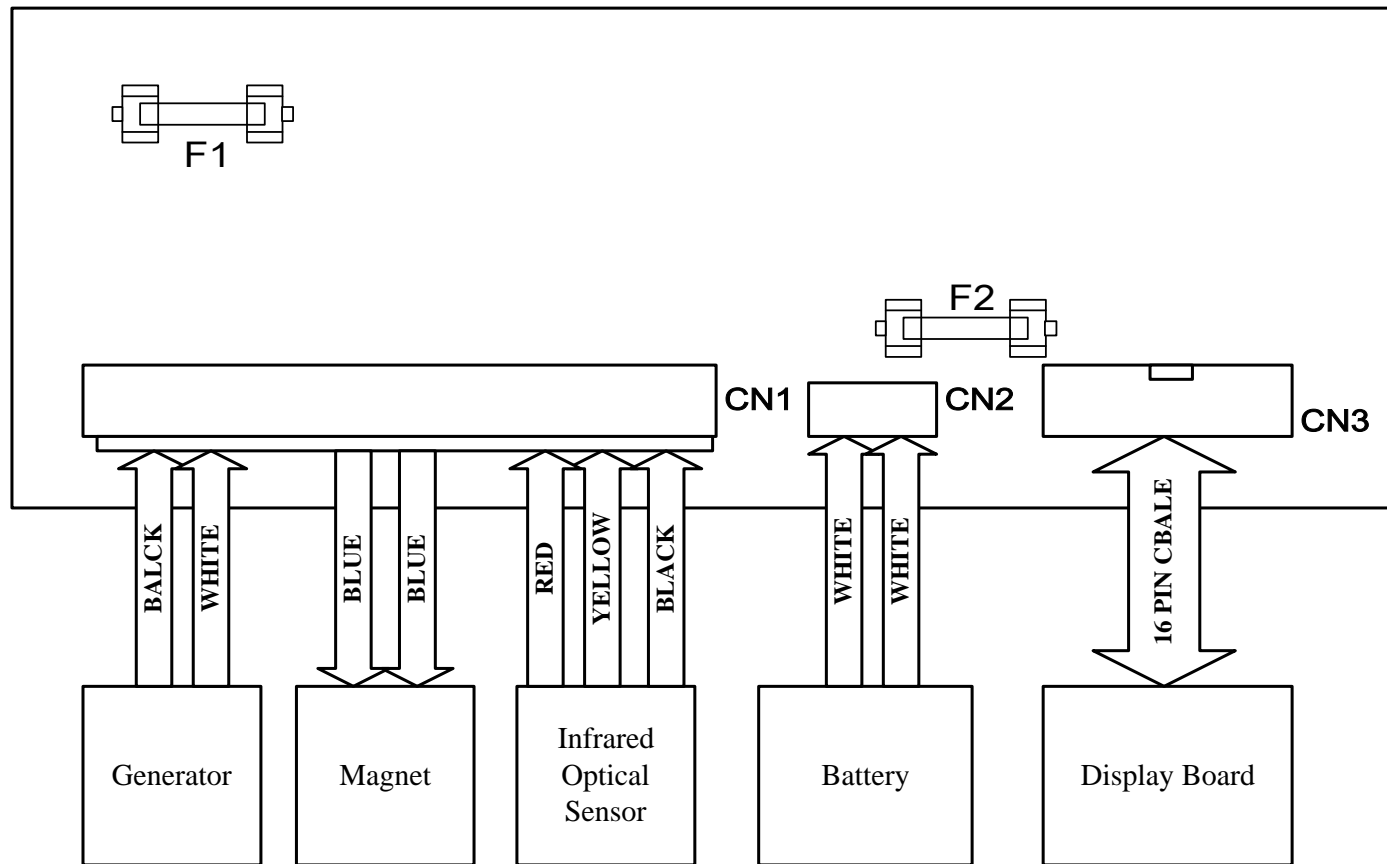
## 5100/5150 Display Board Wiring Connection Diagram



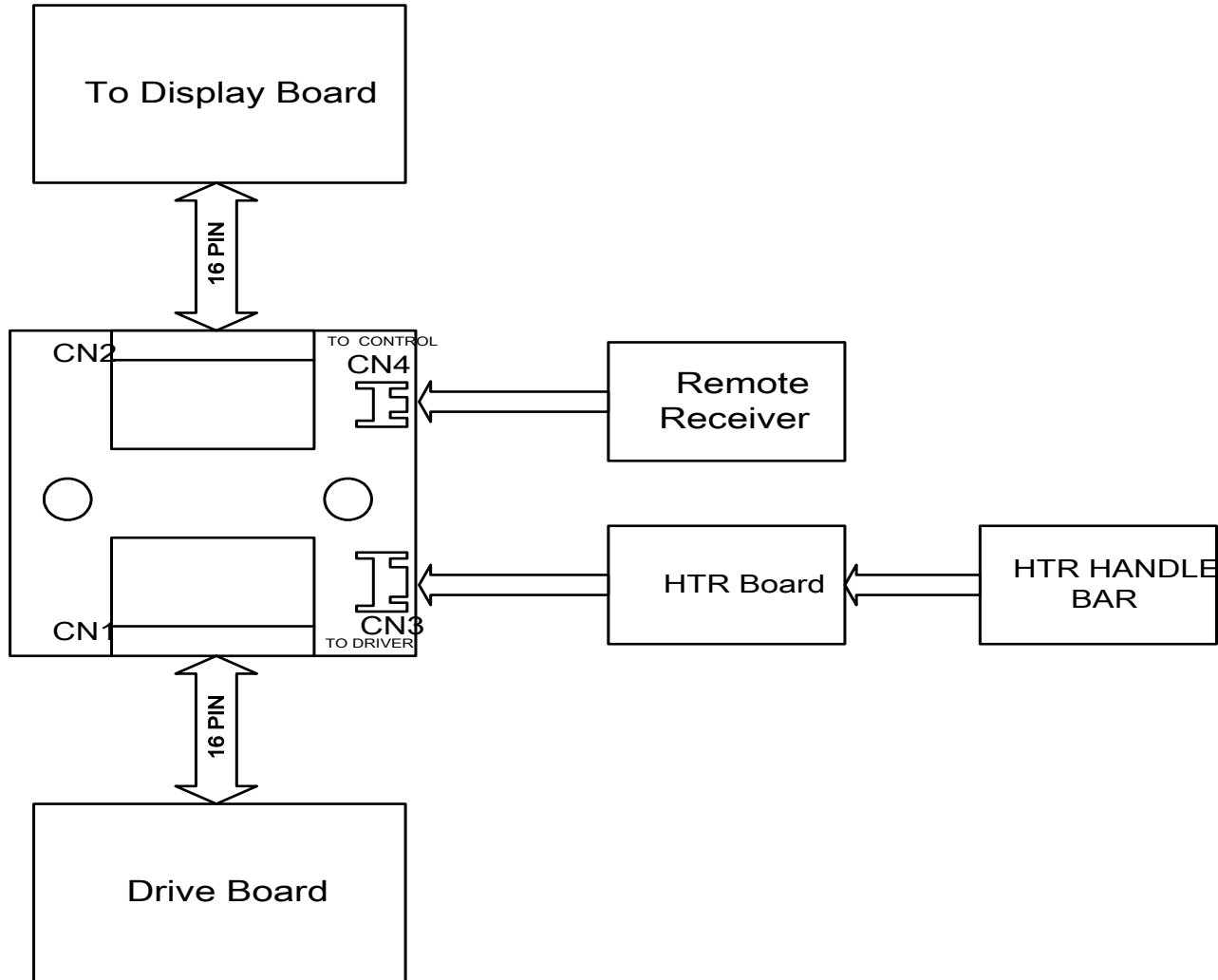
## 5200 Display Board Wiring Connection Diagram



## 5100/5150/5200 Drive Board Wiring Connection Diagram



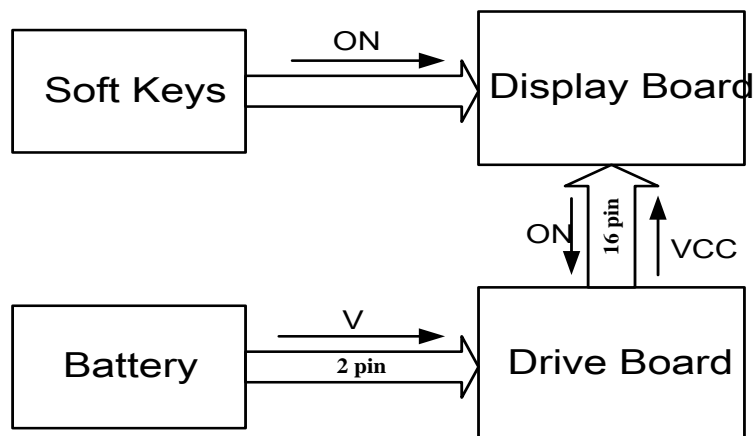
## 5100/5150 Wire Hub Connection Diagram



## **Chapter 2. Operation Flow Charts**

## 5100/5150/5200 Battery Switch Operation Chart

### I. Configuration



### 2. Operation

Order	Item	Operation
1	Battery	1. When the bicycle isn't being ridden, drive board temporary power supply allows the display board to light up. 2. Riding for 20 minutes recharges the battery.
2	Soft keys	1. When the unit is off, pressing the display board "ON" key sends a message prompting the drive board to start unit operation.
3	Display board	1. The soft key "ON" signal is sent to the drive board.
4	Drive board	1. The "ON" signal sends the battery voltage to the drive board. 2. After stabilizing the battery voltage, the drive board provides power to the display board, starting up the display.
5	Display board	1. After getting power, the display board beeps; 2. The display windows light and numbers appear.

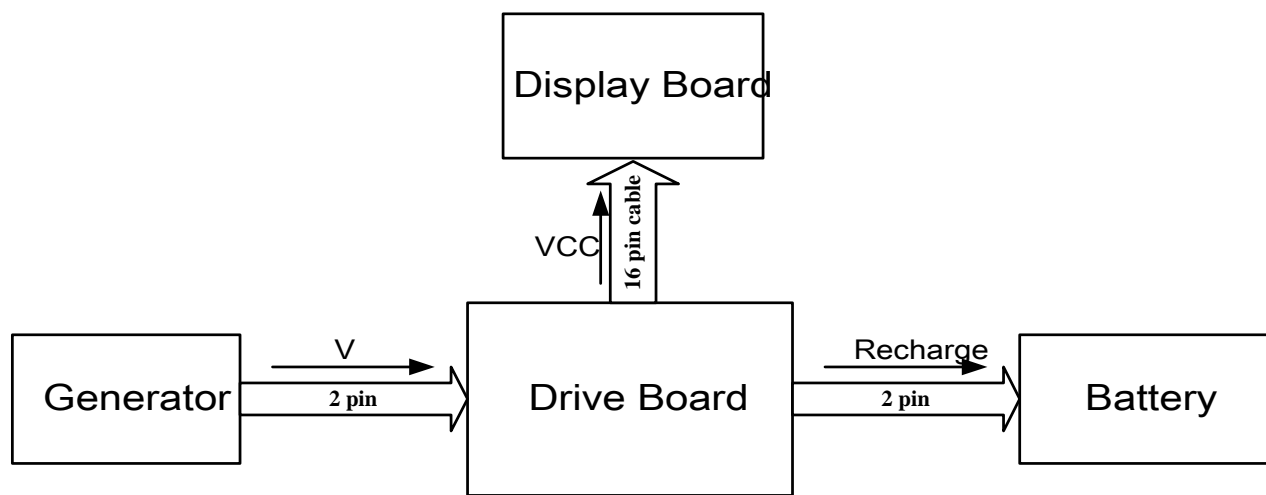
## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 3. Operational Steps

Steps	Operation
1	Display panel is inactive, dark.
2	Press the ON key.
3	1. Display panel beeps once. Main display shows "MAN'L" 2. Windows show "0".

## 5100/5150/5200 Generator Voltage Operation Chart

### I. Configuration



### 2. Operation

Order	Item	Operation
1	Generator	1. When the bike is ridden, the generator makes power.
2	Drive Board	1. The generator provides voltage to the drive board.
3	Display Board	1. The drive board VCC circuit provides power to the display board. 2. The display lights.
4	Battery	1. The drive board provides processed power from the generator to recharge the battery.

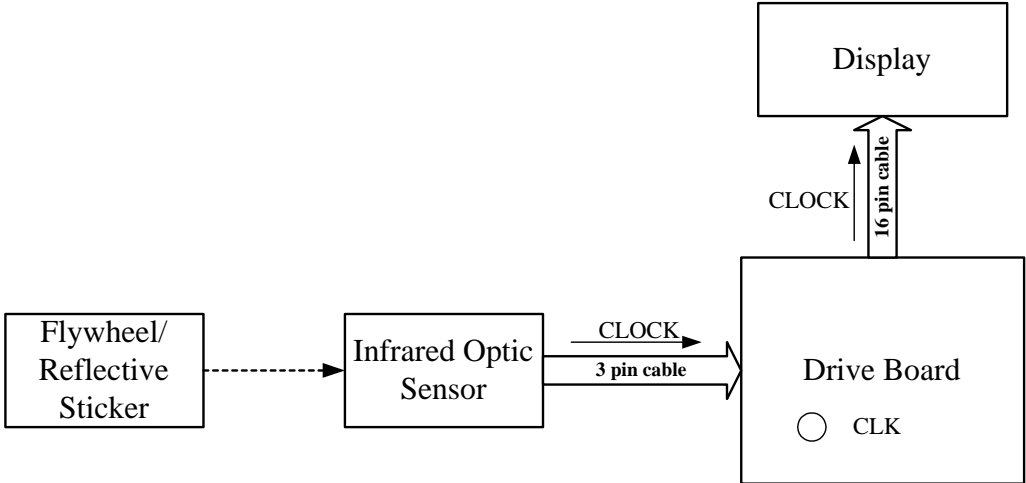
## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 2. Operational Steps

Steps	Operation
1	Display panel is inactive, dark.
2	Start riding the bike.
3	The display panel beeps once. The main display shows "MAN'L". Other windows show "0".

# 5100/5150/5200 RPM Process Flow Chart

## I. Configuration



## 2. Operation

Item	Operation
Flywheel	1. When the bike is ridden, the reflector sticker on the flywheel rotates.
Infrared Optic Sensor	1. The optic sensor emits a signal to the sticker and detects the sticker teeth rotation.
Drive Board	1. Once the infrared optic sensor signal information is processed, the drive board CLK indicator lights. 2. The drive board CLK indicator flashes or remains lit.
Display Board	1. The program processes the infrared optic sensor information, calculating the RPM value. 2. The RPM value shows on the RPM window.

## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

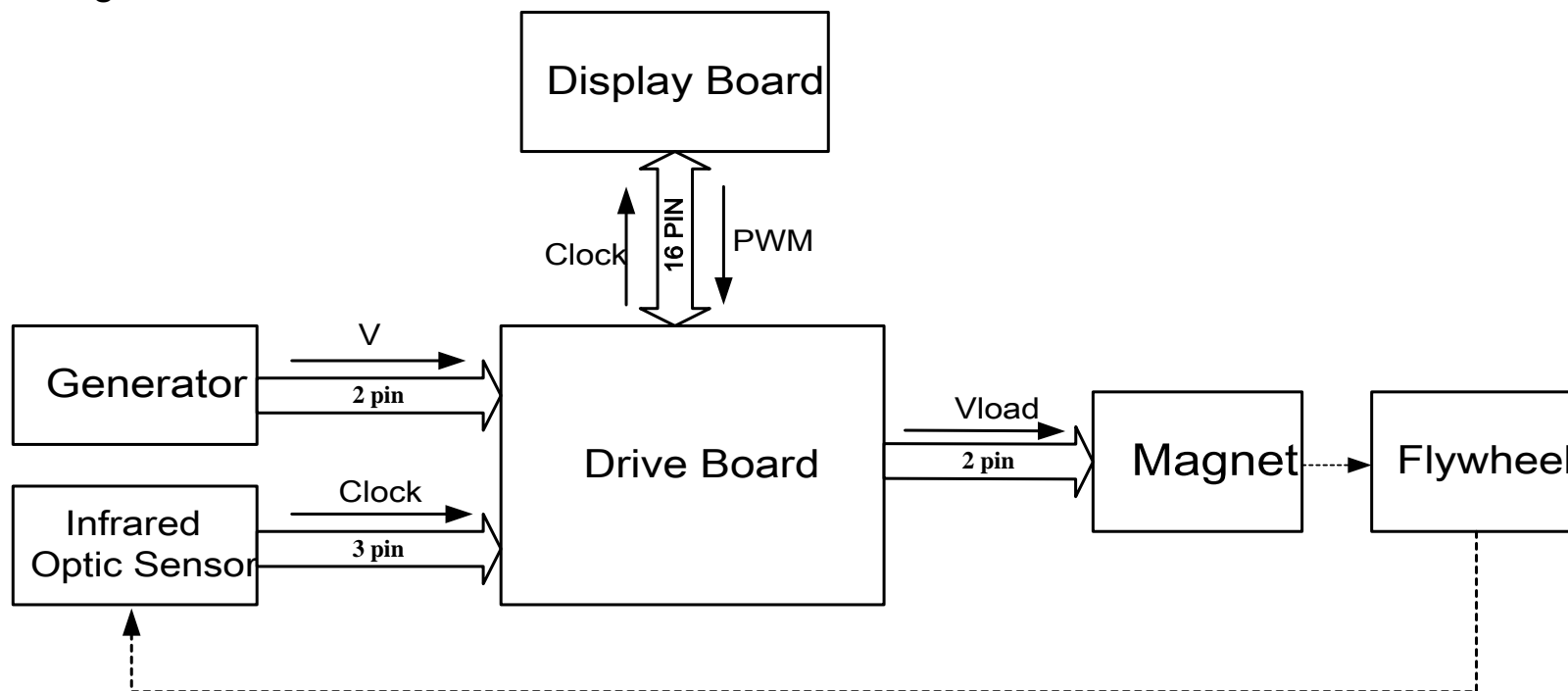
### 3. Operational Steps

Step	Operation
1	Start riding the bike; the display beeps and starts operating.
2	Start riding the bike; the flywheel rotates (the reflective sticker rotates).
3	The RPM window shows the RPM value.
4	If the flywheel rotates once every second, the RPM window shows "60".

Note : RPM= revolutions per minute

## 5100/5150/5200 Resistance Operation Flow Chart

### I. Configuration



### 2. Operation

Order	Item	Operation
1	Generator	1. The generator produces power when the bicycle is ridden. 2. The generator supplies the drive board with power. 3. And the load resistance receives the power it needs.
2	Infrared Optic Sensor	1. The optic sensor emits a signal to the flywheel reflective sticker. 2. The sensor determines the reflective sticker tooth count.

## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 5100/5150/5200 Resistance Operation Flow Chart

#### 2. Operation

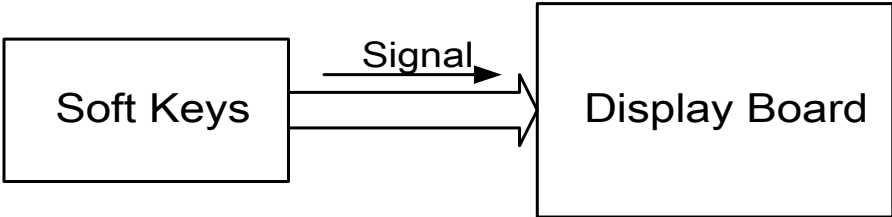
Order	Item	Operation
3	Drive Board	1.The drive board processes the infrared optic sensor signal into the CLOCK signal. 2.The clock signal is sent to the display board, which determines the optic sensor flywheel speed.
4	Display Board	1.After the program determines the CLOCK signal, the RPM value appears in the RPM window. 2.After determining the RPM value, the display board sends the PWM signal to the drive board.
5	Drive Board	1.After processing the PWM signal, the drive board supplies voltage to the electro-magnet, thus controlling the magnet resistance.
6	Magnet	1.The strength of the magnetic attraction corresponds to the voltage received from the drive board.The higher the voltage, the stronger the resistance.

#### 3. Operational Steps

Order	Item	Operation
1	Press LOAD<▼>	Continuously press the display LOAD<▼> key until LOAD window shows "1".
2	Start riding the bike	Ride the bike.The resistance is light.
3	Press LOAD<▲>	Continuously press the display LOAD<▲> key until the LOAD window shows "14".
4	Ride the bike	Ride the bike.The resistance is heavy.

# 5100/5150/5200 Display Keypad Function Flow Chart

## 1. Configuration



## 2. Operation

Item	Operation
Soft Keys	1. Press the display panel soft keys. 2. The soft key signal is sent to the display board.
Display Board	1. The CPU processes the soft key signal. 2. The CPU prompts action by the unit.

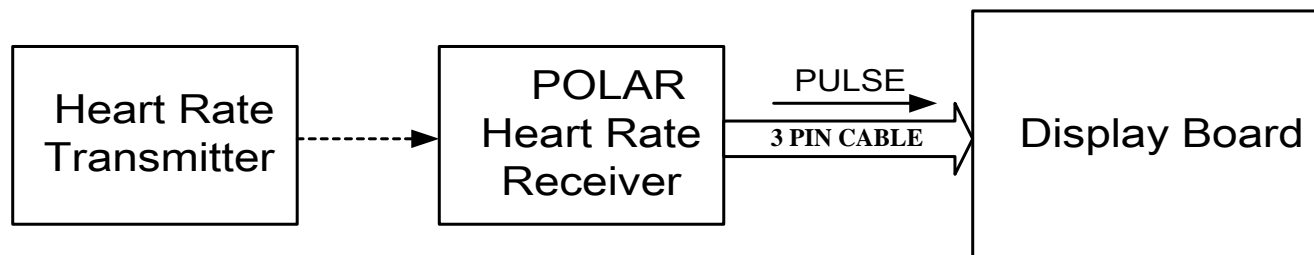
## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 3. Operational Steps

Key	Operation
DISTANCE<▲> Key	Continuously press DIST<▲> key, DIST window values increase to 99.9.
DISTANCE<▼> Key	Continuously press DIST<▼> key, DIST window values decrease to 0.
TIME<▲> Key	Continuously press TIME<▲>key, TIME window values increase to 99.00.
TIME<▼> Key	Continuously press TIME<▼>key, TIME window values decrease to 0.
LOAD<▲> Key	Continuously press LOAD<▲>key, LOAD window values increase to 14.
LOAD<▼> Key	Continuously press LOAD<▼>key, LOAD window values decrease to 1.
<MANUAL/SET> Key	Repetitively press <MAN'L> key, the display continuously shows: (1) If the unit has no HRC function, the display alternates between “MAN'L” and “SET” notices. (2) If the unit has HRC function, the display alternates between “MAN'L” and “SET” and “HRC” notices.
<INTERVAL> Key	Repetitively press <INTV> key, the display alternates between “INTV1” and “INTV2” notices.
<PROGRAM> Key	Repetitively press <PROG> key, the display shows “PRO 1” to “PRO 12” notices in numerical order.
<RESET> Key	When the display shows “MAN'L” mode, press the <RESET> key. The display will beep once and LOAD window shows “1”.
<ON> Key	When the display is off, press the <ON> key. The display beeps once and starts operating.

## 5100/5150/5200 POLAR Heart Rate Operation Flow Chart

### I. Configuration



### 2. Operation

Item	Operation
Heart Rate Transmitter	1. Put the POLAR transmitter in place. 2. The POLAR transmitter detects the user's pulse and sends the heart rate signal to the receiver. 3. The POLAR heart rate signal is transmitted up to three feet (90 cm).
POLAR Heart Rate Receiver	1. The POLAR heart rate receiver receives the heart rate signal from the heart rate transmitter. 2. After being processed, the heart rate signal travels through the 3-PIN cable to the display board.
Display Board	1. The display board receives and processes the signal. The main program determines the heart rate value. 2. The PULSE window shows the heart rate value.

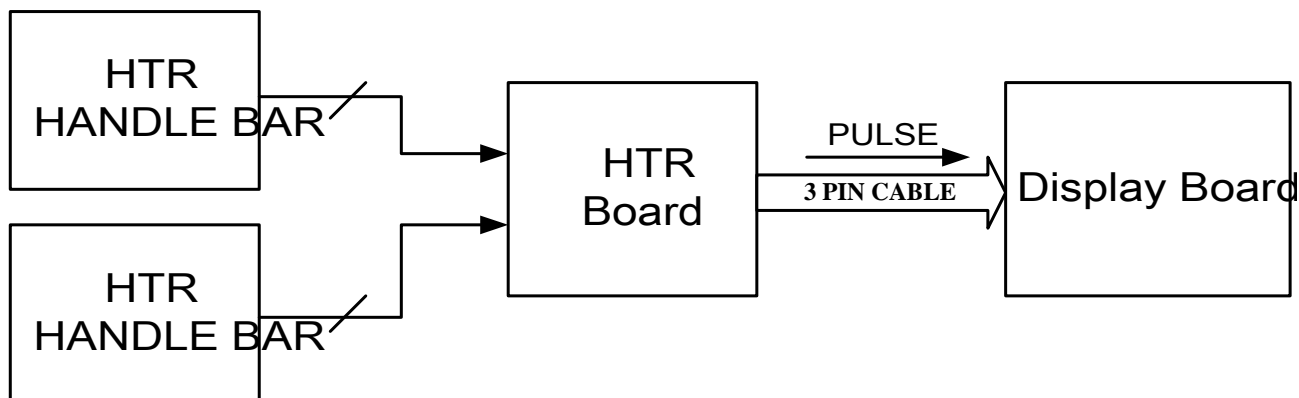
## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 3. Operational Steps

Step	Operation
1	Put the POLAR transmitter in place. Operate the bicycle.
2	Within 5 seconds, the PULSE window shows the heart rate value.

## 5100/5150/5200 HTR Operation Flow Chart

### I. Configuration

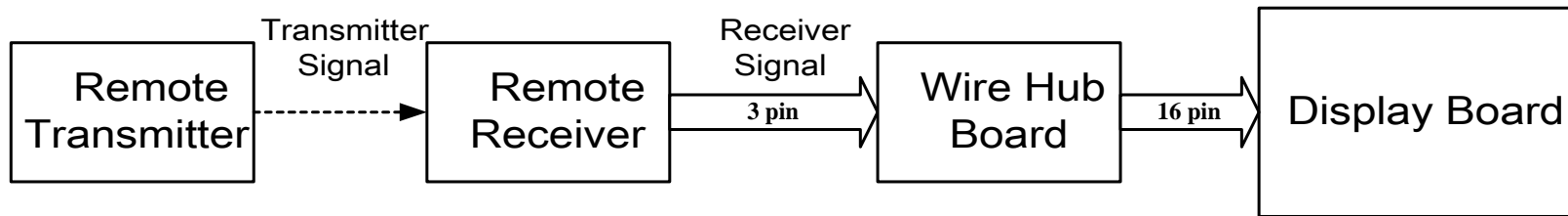


### 2. Operation

Item	Operation
HTR Handlebar	1. Hold the HTR handlebar. The pulse mark signal travels from the handlebar to the HTR board.
HTR Board	1. Processing by the HTR board turns the pulse mark signal into the pulse signal, which is then sent to the display board. 2. The HTR board indicator light shows the pulse. Please refer to the HTR instructions.
Display Board	1. The display board main program determines the heart rate value. 2. The display PULSE window shows the heart rate value.

## 5100/5150 Remote Control Function Flow Chart

### I. Configuration



### 2. Operation

Item	Operation
Remote Transmitter	<ol style="list-style-type: none"> <li>1. Press remote control key.</li> <li>2. Remote transmitter emits remote signal.</li> </ol>
Remote Receiver	<ol style="list-style-type: none"> <li>1. Receiver receives the transmitter signal.</li> <li>2. The signal travels the 3-pin cable to the remote hub board.</li> </ol>
Remote Wire Hub	<ol style="list-style-type: none"> <li>1. The hub board transmits the signal through the 16-pin cable to the display board.</li> </ol>
Display Board	<ol style="list-style-type: none"> <li>1. The display board central processing unit (CPU) deciphers the signal, transforming it into the keypad signal.</li> <li>2. The CPU issues the command.</li> </ol>

## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

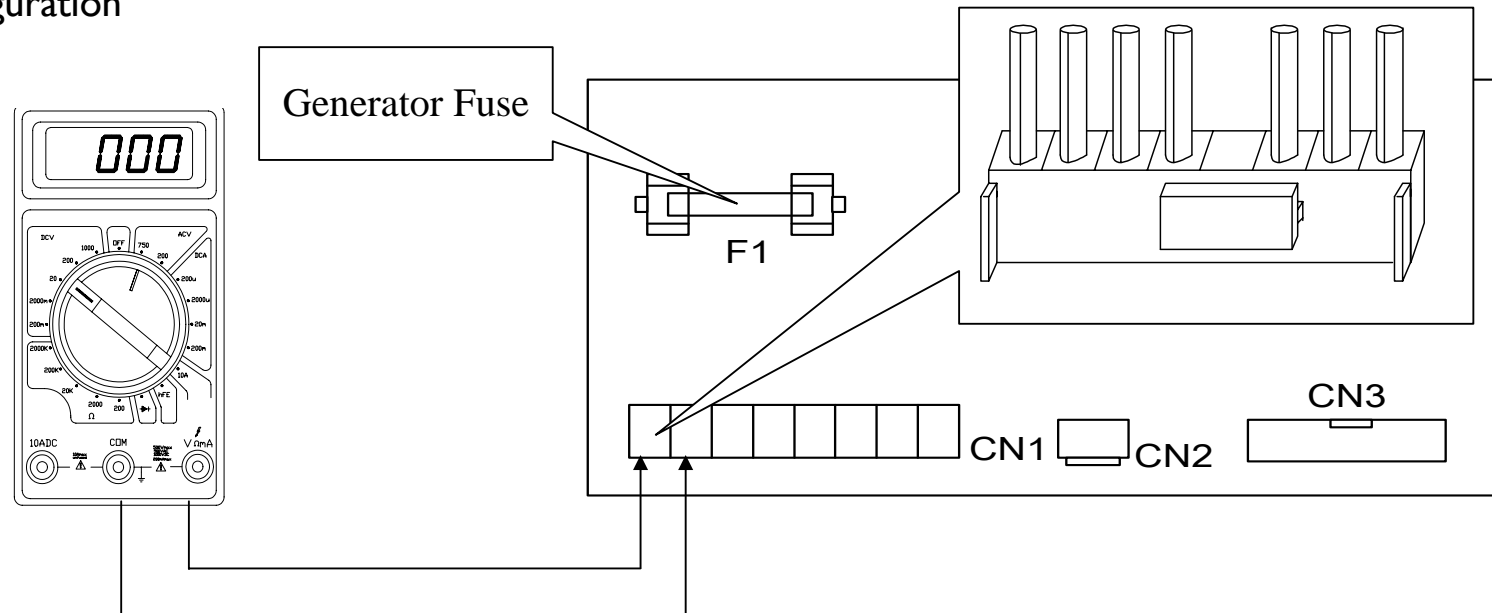
### 3. Operational Steps

Step	Operation
<MAN'L> Key	When the main display shows "MAN'L" mode, repetitively press the <MAN'L> key. (1) If the unit doesn't have HRC function, the display alternates between "MAN'L" and "SET" notices. (2) If the unit has HRC function, the display alternates between "MAN'L" and "SET" and "HRC" notices.
<RESET> Key	When the display shows "MAN'L" mode, press the <RESET> key; LOAD window shows 1.
TIME<▲>	When the TIME<▲> key is pressed, the TIME window numerical values increase to 99.0.
TIME<▼>	When the TIME<▼> key is pressed, the TIME window numerical values decrease to 00.00.
DIST<▲>	When the DIST<▲> key is pressed, the DIST window numerical values increase to 99.9.
DIST<▼>	When the DIST<▼> key is pressed, the DIST window numerical values decrease to 00.00.
LOAD<▲>	When the LOAD<▲> key is pressed, the LOAD window numerical values increase to 14.
LOAD<▼>	When the LOAD<▼> key is pressed, the LOAD window numerical values decrease to 1.

## **Chapter 3. Test Configurations**

## 5100/5150/5200 Testing the Generator

### I. Configuration



### 2. Test Procedure

2-1. Put the multimeter to the DC 200V setting.

2-2. Place one probe on the white wire and the other probe on the black wire connector point of CON1 on the drive board, as shown in the illustration above.

2-3. Ride the bike. The multimeter should show 20VDC or more, and you should hear a beep sound as the display turns on.

2-4. If there's no voltage, inspect (1) the generator or its wiring and (2) the generator fuse F1.

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### 3. Circumstance of Malfunction

3-1. Bike is ridden but it doesn't turn on.

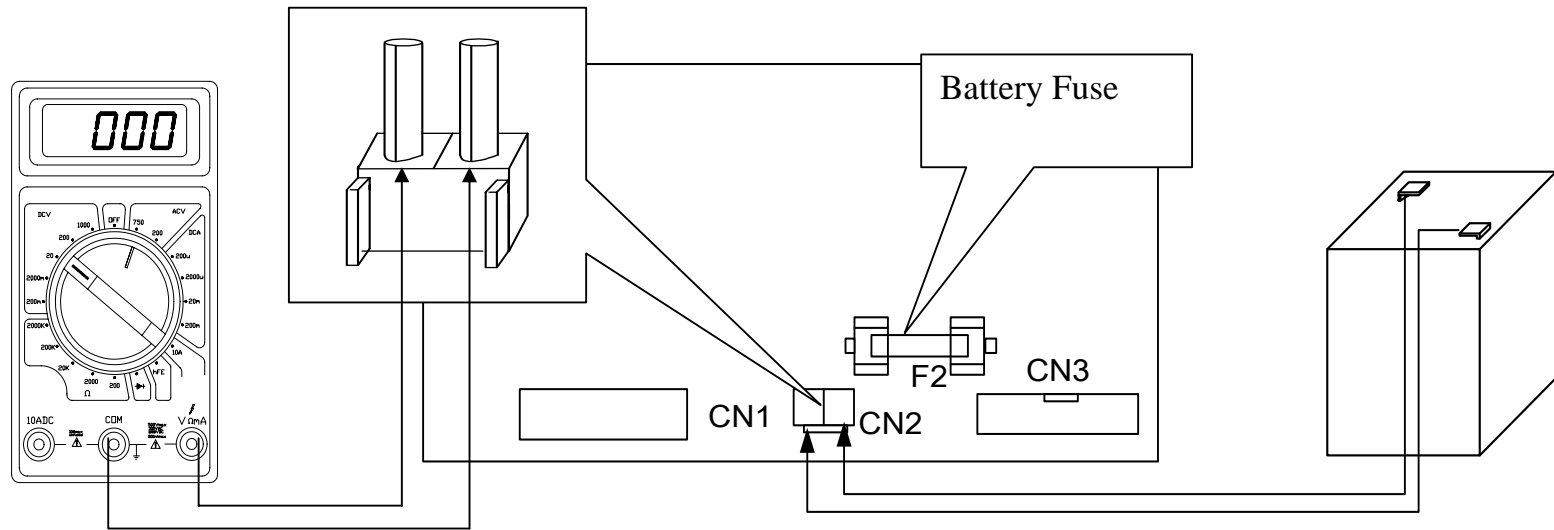
3-2. There is no resistance whatsoever.

3-3. While being ridden, the bicycle display freezes.

3-4. Drive board FI fuse breaks.

## 5100/5150/5200 Testing the Battery

I. Configuration: Connect as Shown Below



### 2. Test Steps

- 2-1. Remove wires attached to connector CN2.
- 2-2. Check whether the battery fuse F2 is broken. If broken, replace it.
- 2-2. Put the multimeter to the DC 20V setting.
- 2-3. Place the probes on the battery connector points as shown above.
- 2-4. The multimeter reading should show 5.0V or more.
- 2-5. If the battery voltage is less than 5.0V, ride the bike for 20 minutes or more.

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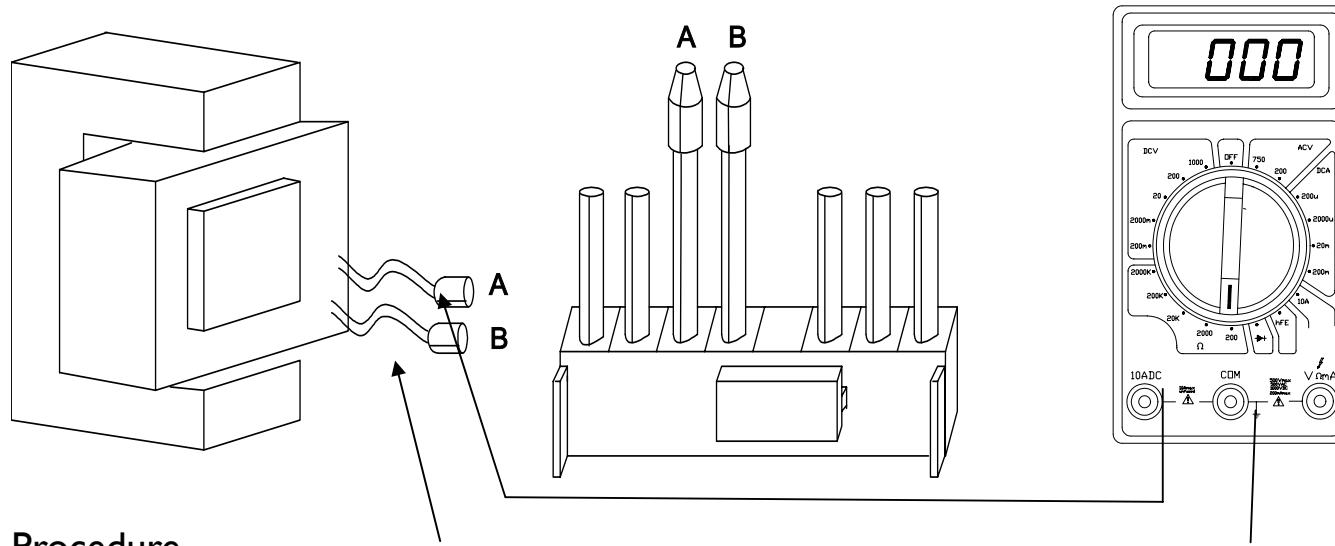
### 3. Circumstance of Malfunction

3-1. Press the display <ON> key; The display doesn't light.

3-2. Ride the bike; The display doesn't operate.

## 5100/5150/5200 Testing the Electro-Magnet

### I. Configuration



### 2. Test Procedure

#### 2-1. Electro-Magnet Ohm Testing

2-1-1. Put the multimeter to the 200 ohm setting. Remove wires from the CON1 connector on the drive board.

2-1-2. Place probes separately on the ends of the blue wires. The reading should show 18-20 ohms.

2-1-3. If no value appears, the magnet or its wires are broken. Inspect the thin wires going into the magnet; Sometimes they pull out. If so, solder again and wrap the wire with electrical tape. If the meter shows "0" or "0.4" ohms, the magnet has developed a short. Replace the magnet.

## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 2-2. Current Leakage Test

2-2-1. Put the multimeter to the 200VDC setting. Place the red probe on one of the blue wire connector points. Place the black probe on a unit screw or on bare metal on the frame.

2-2-2. Normal reading: no change – just like when you wave two probes in the air without touching.

2-2-3. If the multimeter shows “0” or “0.4”, the magnet has shorted out against the frame. If the uninsulated magnet wire touches the frame, wrap the wire with electrical tape.

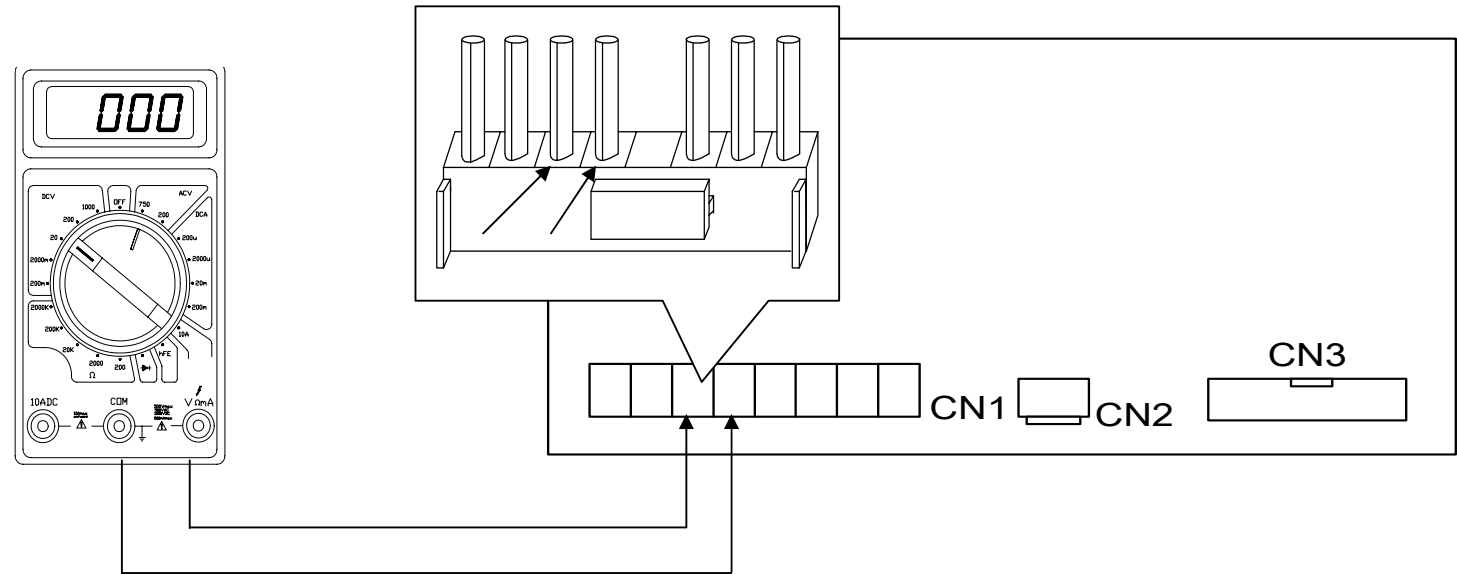
### 3. Circumstance of Malfunction

3-1. Ride the bike. There's no resistance.

3-2. Ride the bike. FI fuse breaks.

## 5100/5150/5200 Testing Resistance Voltage at the Drive Board

### I. Configuration



### 2. Test Procedure

- 2-1. Set the multimeter to the DC 200V setting.
- 2-2. Place probes on the drive board CON1 blue wire connection terminals as shown.
- 2-3. Ride the bike. Press the level up key. The meter should show voltage. There should be resistance.
- 2-4. If there is no voltage, inspect the following: optic sensor, generator, drive board, wire, display board.

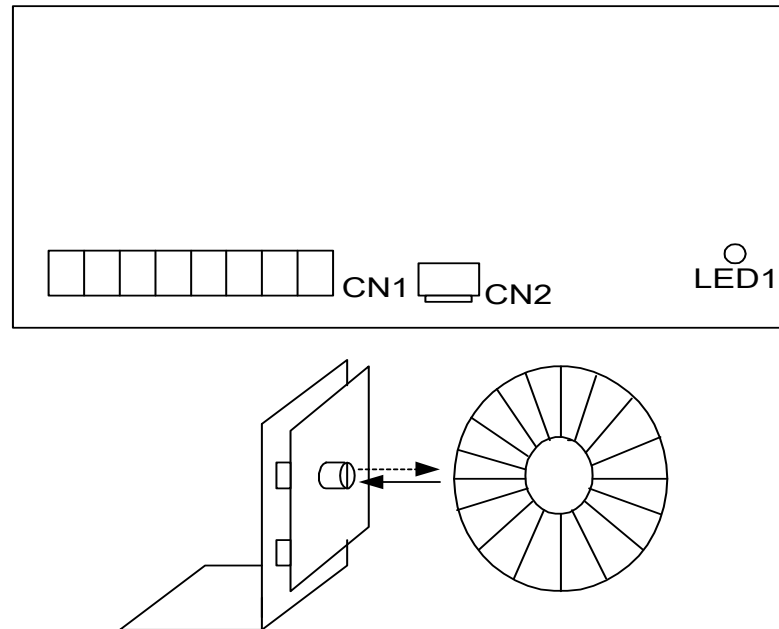
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### 3. Circumstances of Malfunction

3-1. Ride the bike; there is no resistance.

## 5100/5150/5200 Testing the Infrared Optic Sensor

### I. LED1 (CLK) and Infrared Optic Sensor Test Configuration



### 2. Test Procedure

2-1. Ride the bike.

2-2. Inspect whether LED1 on the drive board flashes or remains lit.

2-3. After the LED lights, inspect whether the display RPM window shows a value.

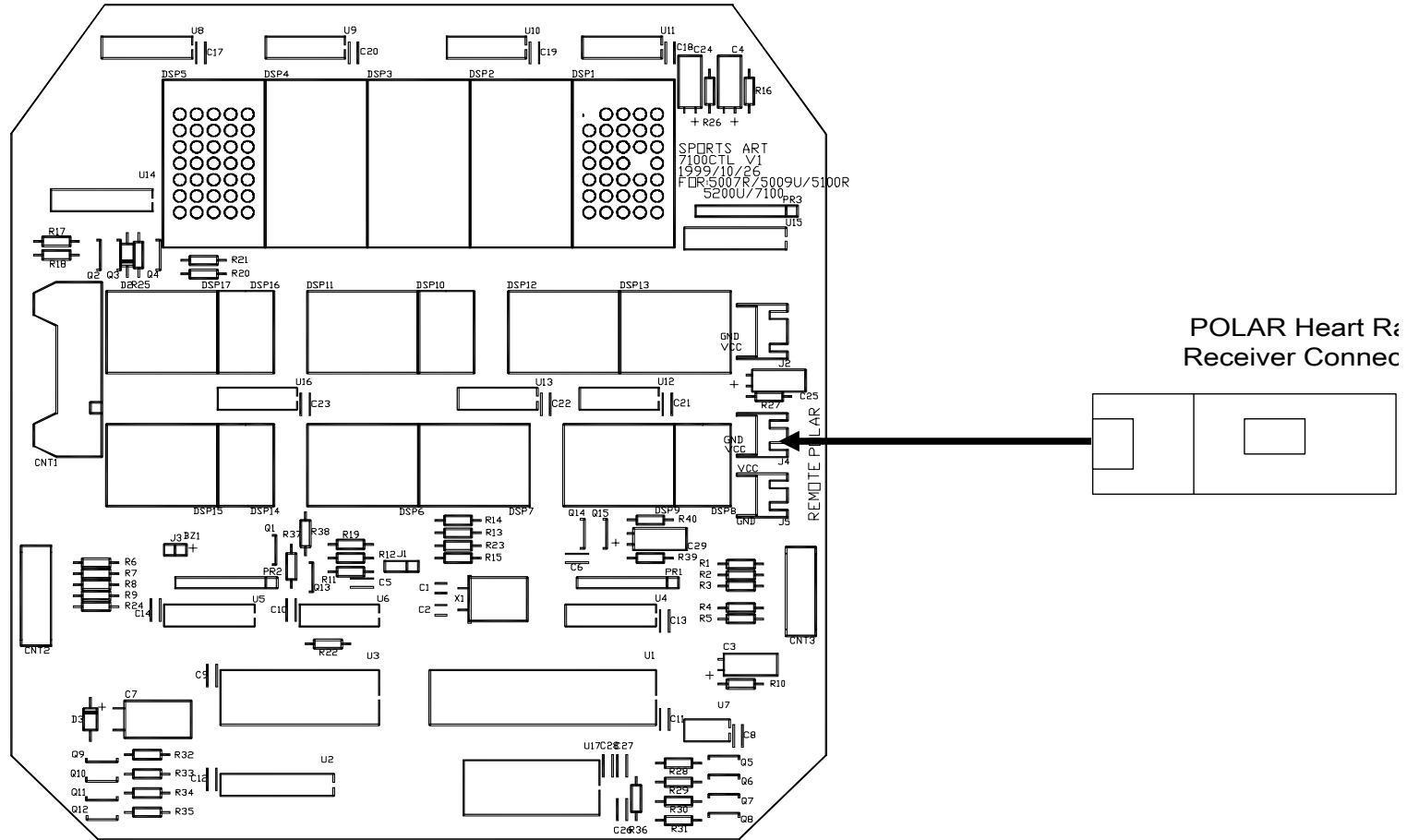
2-4. If not as above, inspect (1) the infrared optic sensor and tachometer wheel for a distance of 3-7 mm; (2) infrared optic sensor; (3) optic sensor wiring; (4) drive board.

## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 3. Circumstance of Malfunction

- 3-1. Display board RPM window has no RPM value.
- 3-2. When ridden, the bike resistance is too heavy.
- 3-3. When ridden, the bike resistance is too light.

# 5100/5200 Testing the POLAR Heart Rate Configuration



## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 2. Test Procedure

- 2-1. Inspect whether the wiring of the POLAR heart rate receiver is as shown above.
- 2-2. Put the POLAR heart rate transmitter in place.
- 2-3. Press the display <ON> key; The start-up display lights up.
- 2-4. The display PULSE window shows the heart rate within 10 seconds.
- 2-5. If the pulse rate doesn't light up, inspect (1) the display board wiring terminal soldering;
  - (2) Heart rate wiring;
  - (3) POLAR receiver soldering and blue antenna connection;
  - (4) Make sure nothing metal, including the serial number sticker, is on top of the POLAR receiver board;
  - (5) Replace the POLAR transmitter.

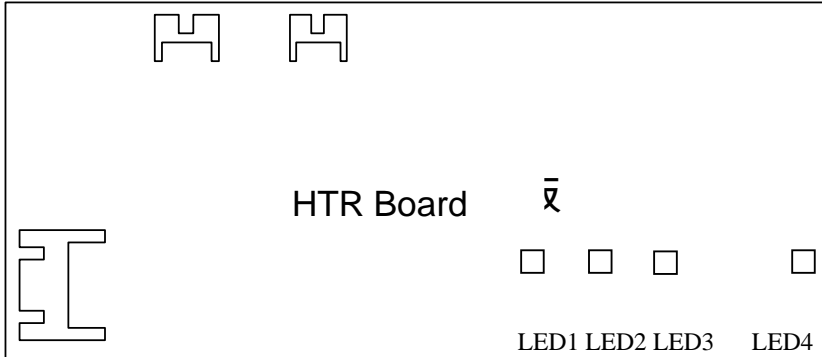
### 3. Circumstance of Malfunction

- 3-1. Put the POLAR transmitter in place; display PULSE window doesn't show any heart rate value.

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**5100/5150/5200 Testing the HTR Board**

I. Configuration



HTR Board	LED1	LED2	LED3	LED4
HTR	X - Not lit in HTR mode.	Lights when user holds onto HTR handlebars.	Flashes to indicate incoming HTR signal.	Lights when HTR handlebars are held; Flashes when HTR signal is sent to display.
Polar	Flashes to indicate incoming POLAR signal.	X - Doesn't light in POLAR mode.	X - Doesn't light in POLAR mode.	Flashes when POLAR signal is sent to display.

## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 2. Test Procedure

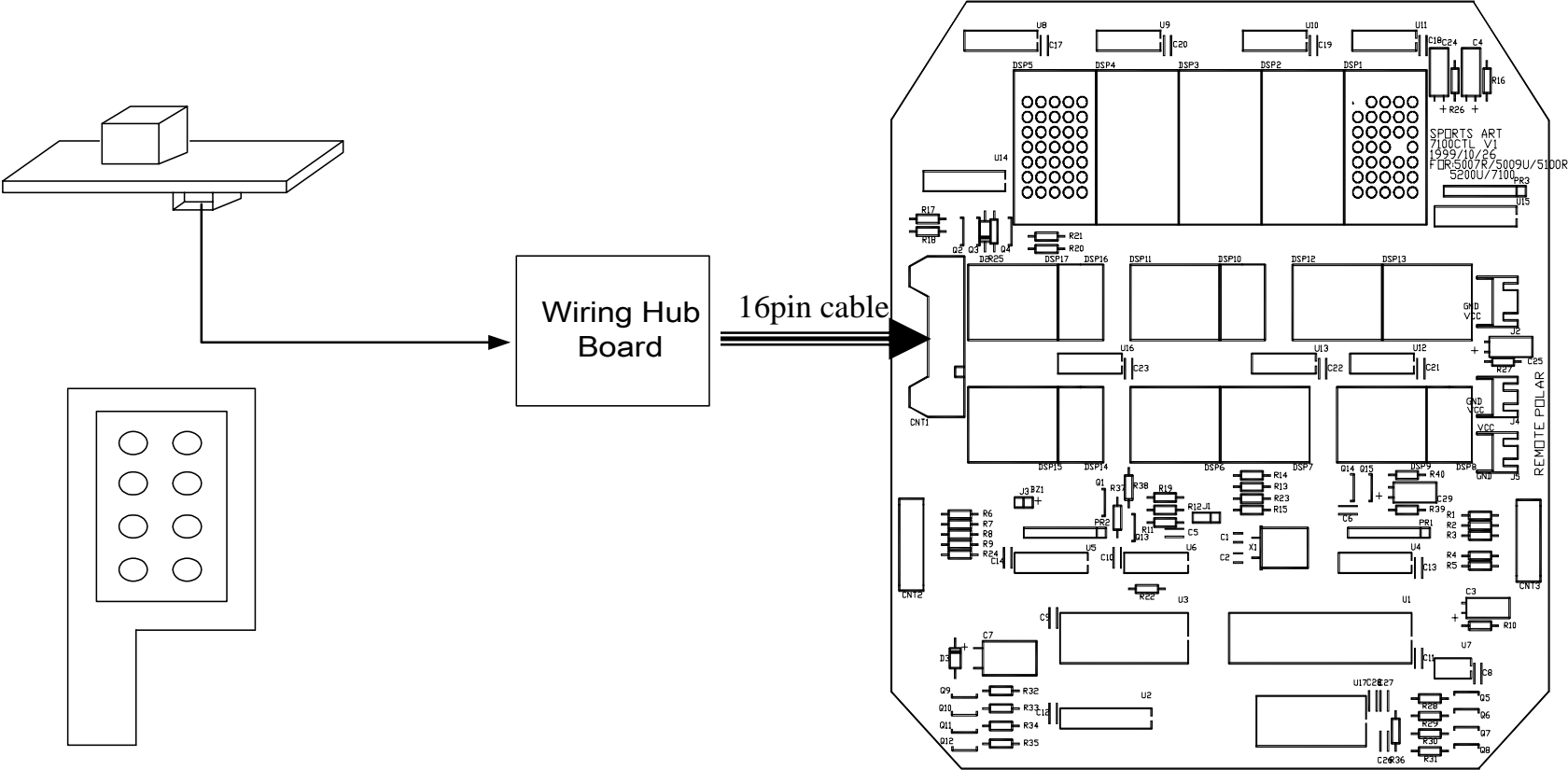
Malfunction	Cause	Part in Question
LED1 (POLAR) not flashing	POLAR receiver is not detecting a heart rate or the signal is not getting to the HR board.	POLAR transmitter, POLAR receiver board, wires
LED2 (HTR) not lighting	HTR handlebar is not being held or there is no detection of a signal at the HR board.	HTR handlebar, wire from HTR board to handlebar
LED3 (HTR) not flashing	Signal is not arriving from HTR handlebars.	HTR handlebar, cable, HR board
LED4 (HTR+POLAR) not flashing	POLAR receiver or HTR is not emitting a heart rate signal to the display.	If all other HR board LEDs are normal, replace the HR board.
Display Shows No HR Value	If HR board LEDs are normal, inspect the 3-pin cable, its connections, and the display board	3-pin cable, connections, display board

### 3. Circumstance of Malfunction

1. Place hands on the HTR handlebar; the display PULSE window doesn't show the heart rate value.
2. After turning on the unit or in mid use, the PULSE window shows a pulse value when none should appear.
3. When holding the HTR handlebar, the display PULSE window heart rate value and the user's actual heart rate vary too much.
4. When using the POLAR transmitter, the display PULSE window shows no heart rate value.
5. When using the POLAR transmitter, the display PULSE window and actual heart rate value differ.

# 5100/5150/5200 Testing the Remote Receiver

## I. Configuration



## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 2. Test Procedure

2-1. Inspect the remote transmitter batteries.

2-2. Inspect remote control key operation according to the table below.

Key	Operation
<MAN'L> Key	With the display in "MAN'L" mode, showing "MAN'L", repetitively press the <MAN'L> key. (1)If the unit doesn't have HRC, the display will alternate between "MAN'L" and "SET" notices. (2)If the unit has HRC, the display will alternate between "MAN'L", "SET" and "HRC" notices.
<RESET> Key	With the display in "MAN'L" mode, showing "MAN'L", press the <RESET>key; The LOAD window shows 1.
TIME<▲> Key	Press the TIME<▲> key; numerical values in the TIME window increase up to 99.0.
TIME<▼> Key	Press the TIME<▼> key; numerical values in the TIME window decrease to 00.00.
DIST<▲> Key	Press the DIST<▲> key, numerical values in the DIST window increase to 99.9.
DIST<▼> Key	Press the DIST<▼> key, numerical values in the DIST window decrease to 0.
LOAD<▲> Key	Press the LOAD<▲> key, numerical values in the LOAD window increase to 14.
LOAD<▼> Key	Press the LOAD<▼> key, numerical values in the DIST window decrease to 1.

2-2-3. If not as above, inspect (1) remote control transmitter battery voltage and connections; (2) remote control receiver; (3) display board to remote receiver 3-PIN connection; (4) display board U17 IC.

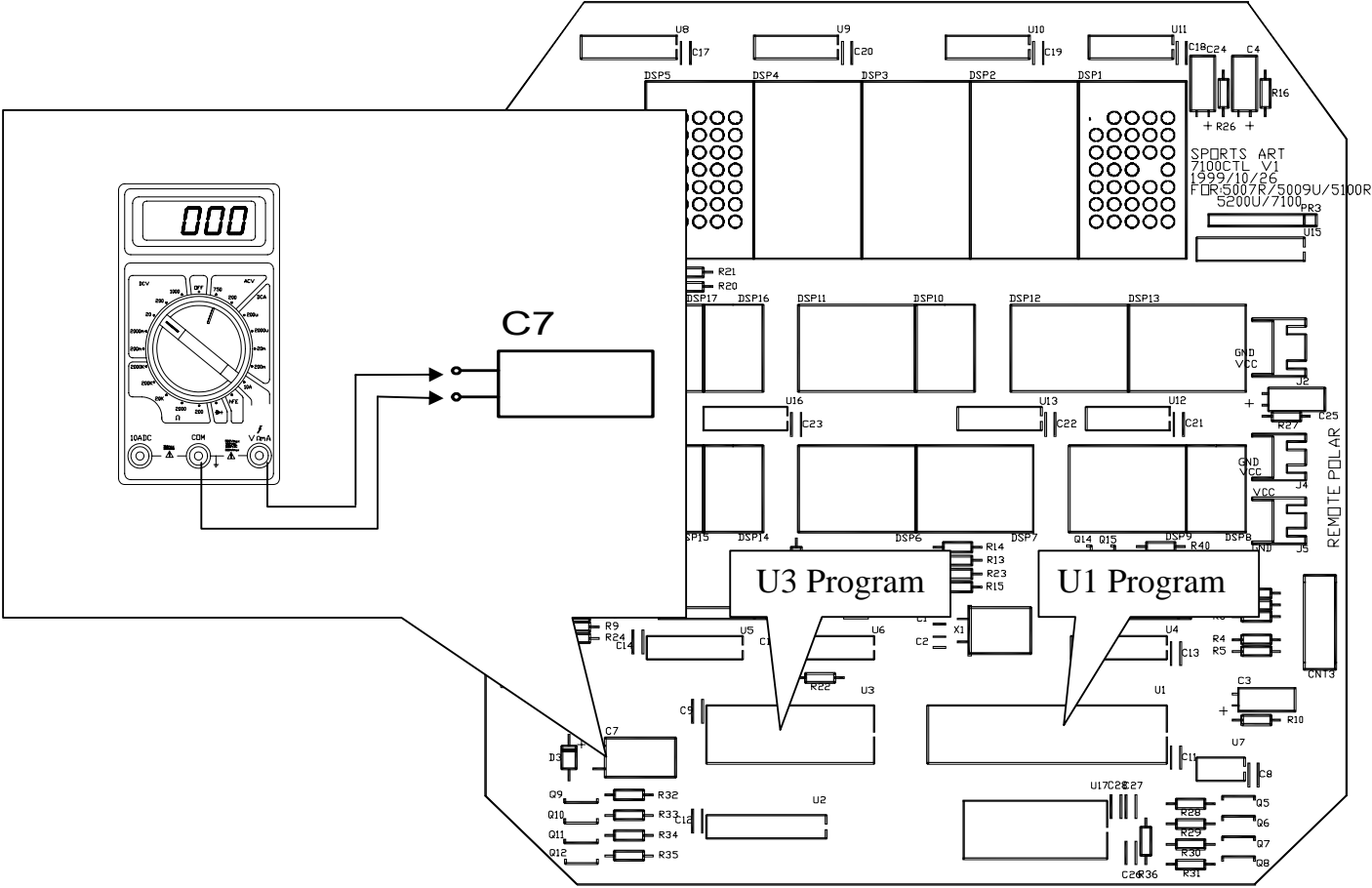
### 3. Circumstance of Malfunction

3-1. When using the remote control, the display makes no "beep" sound.

3-2. When using the remote control, the key function differs from the display action. (What should happen doesn't happen.)

# 5100/5150/5200 Testing the Display Board VCC Voltage

## I. Display Board VCC Voltage Test Configuration



## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 2. Test Procedure

- 2-1. Put the multimeter to the DC 20V setting.
- 2-2. Place probes as shown on C7 capacitor pins.
- 2-3. Ride the bike. The meter should read 4.8-5.2V and the display should beep.
- 2-4. If the voltage is approximately 5V, but the display doesn't light, re-install the main CPU.
- 2-5. If the meter doesn't read about 5V, inspect whether the drive board VCC circuit power. See 3-10-1.

### 3. Circumstance of Malfunction

- 3-1. Press the <ON> key or ride the bike. The bike display doesn't turn on.
- 3-2. When in action, the display suddenly freezes.



## SportsArt 5100/5150/5200 Bicycle Troubleshooting Manual

### 2. Test Steps

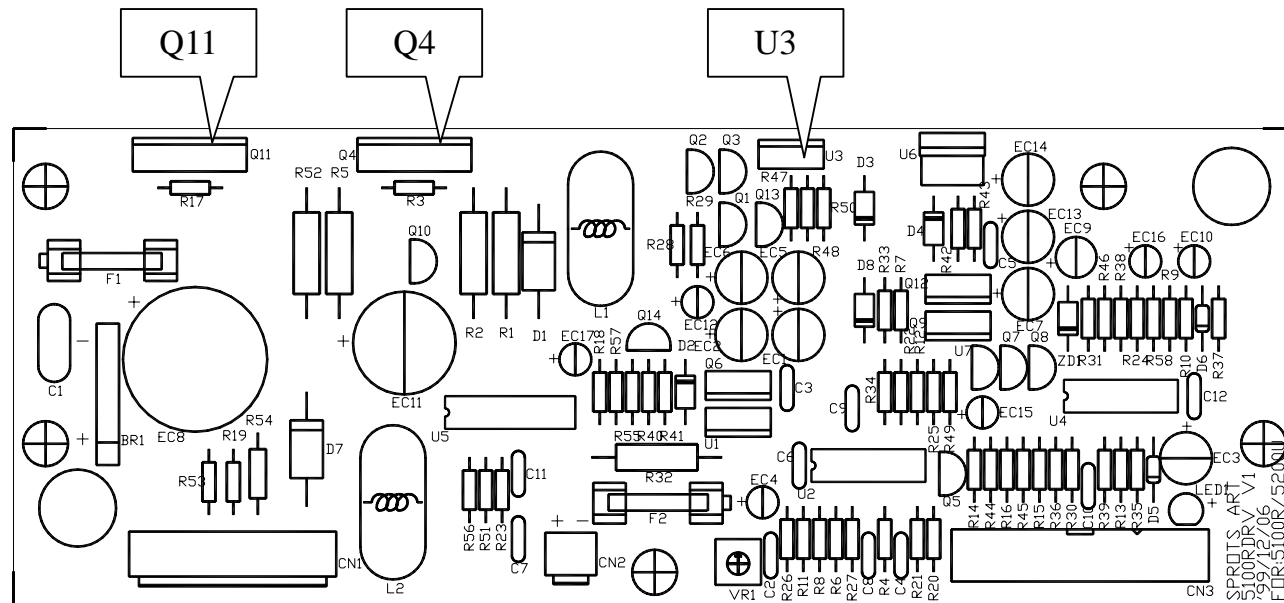
- 2-1. Place the multimeter to the DC 20V setting.
- 2-2. Place the red and black probes on separate legs of the C5 capacitor.
- 2-3. Press <ON> or ride the bike; The multimeter voltage should be from 4.8 to 5.2V.
- 2-4. If not, inspect the F1, F2 fuse. Note: VCC circuit supplies voltage to the display.

### 3. Circumstances of the Malfunction

- 3-1. Press the <ON> key; the display doesn't light.
- 3-2. Ride the bike; the display doesn't light.

## 5100/5150/5200 Testing the Drive Board Power Transistor

### I. Configuration



Note: This test is not recommended since the component must be removed from the drive board. If resistance voltage is high and unchanging, at least one power component on the drive board is bad. Replace the drive board.

### 2. Test Procedure

- 2-1. Q11, Q4, Q3 power transistor
- 2-2. Remove the power transistor insulating cover.
- 2-3. Put the multimeter to the ohm setting.

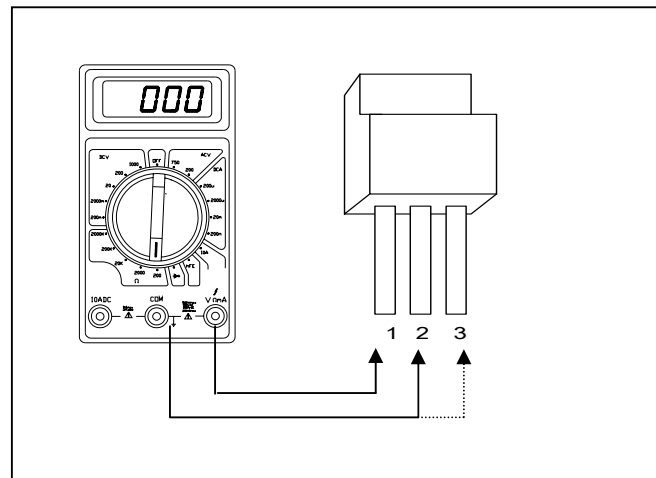
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### 2. Test Procedure (Cont.)

2-3. Put the red probe in contact with the component's first pin. Place the black probe in contact with the power transistor's second pin. The reading should show "1" or "OL".

2-4. Keep the red probe in contact with the power transistor's first pin. Place the black probe in contact with the power transistor's third pin. The reading should not show "0".

2-5. A multimeter reading of "0" or "0.4" indicates a short circuit. Replace the drive board.



### 3. Circumstances of the Malfunction

3-1. Ride the bike; the load resistance is high and doesn't change.

3-2. Ride the bike; there is no load resistance whatsoever.