Bike XT

SERVICE & MAINTENANCE MANUAL

REV. 2.0

TECHNOGYM®
The Wellness Company

The information contained in this manual is intended for QUALIFIED TECHNICIANS who have completed a specific TECHNOGYM training course and are authorized to perform machine start-up and adjustment procedures as well as extraordinary maintenance or repairs which require a thorough knowledge of the machine, its operation, its safety devices and working procedures.

CAREFULLY READ THE INFORMATION CONTAINED IN THIS MANUAL BEFORE PERFORMING ANY MAINTENANCE PROCEDURES ON THE MACHINE

DANGEROUS VOLTAGES PRESENT EVEN WHEN THE MACHINE IS TURNED OFF

NOTE
The information contained in this document is subject to change without notice.

Technogym does not guarantee this documentation in any way. Technogym shall not be held responsible for any errors contained in this manual and declines all liability for accidents or damages resulting from the supply, characteristics and use of this manual.

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1. GENERAL NOTICES

1.1. INTRODUCTION

This document is reserved for Technogym Service technicians, and is intended to provide authorized personnel with the necessary information to correctly carry out repairs and maintenance. A thorough knowledge of the technical information contained in this manual is essential for completing the professional training of the operator.

In order to facilitate consultation, the paragraphs are accompanied by schematic illustrations highlighting the topic covered.

This manual contains notices and symbols which have a specific meaning:

WARNING: non observance may result in accident or injury.

ATTENTION: non observance may cause damage to the machine.

Information about the operation in progress.

OBSERVE: observation about the operation in progress.

1.2. RECOMMENDATIONS

Technogym recommends the following steps for planning repair procedures:

- Carefully evaluate the customer's description of the machine malfunction and ask all the necessary questions to clarify the symptoms of the problem.

- Clearly diagnose the causes of the problem. This manual provides the fundamental theoretical basis, which must then be integrated by personal experience and attendance at the training courses periodically offered by Technogym.

- Rationally plan the repair procedure so as to minimize the downtime necessary for procuring spare parts, preparing tools, etc.

- Access the component to be repaired, avoiding any unnecessary operations. In this regard it will be useful to refer to the disassembly sequence described in this manual.

1.3. GENERAL RULES FOR REPAIR PROCEDURES

1. Always mark any parts or positions which may be confused with each other at the time of reassembly.

2. Use original Technogym spare parts and lubricants of the recommended brands.

3. Use special tools where specified.

4. Consult the technical circulars, which may contain more up-to-date information on adjustments and maintenance than those contained in this manual.

5. Before starting the repair procedure, make sure that the recommended tools are available and in good condition.

6. For the procedures described in this manual, use only the specified tools.

OBSERVE: The tool sizes quoted in this manual are expressed in mm.

2. TECHNICAL CHARACTERISTICS

2.1. MECHANICAL CHARACTERISTICS

Width	51 cm
Length	118 cm
Height	133 cm
Weight	69 Kg

2.2. ELECTRICAL CHARACTERISTICS

Mains voltage	115 - 230 VAC
Frequency	50 - 60 Hz
Consumption	~ 60 Watt - 0.3 A
Fuses	5x20 3.15 A fast-blow

The mains voltage is set by means of a special jumper on the power supply circuit board. An incorrect voltage setting can cause irreversible damage to the power supply unit.

Before changing the mains voltage setting, the machine must be turned off and the mains lead unplugged from the wall output.

2.3. AMBIENT SPECIFICATIONS

Temperature	Operating	5° to 35° C
	Storage	-20 to 55° C
Humidity	Operating	30% to 80% non-condensing
	Storage	5% to 85% non-condensing

2.4. CONFORMITY TO REGULATIONS

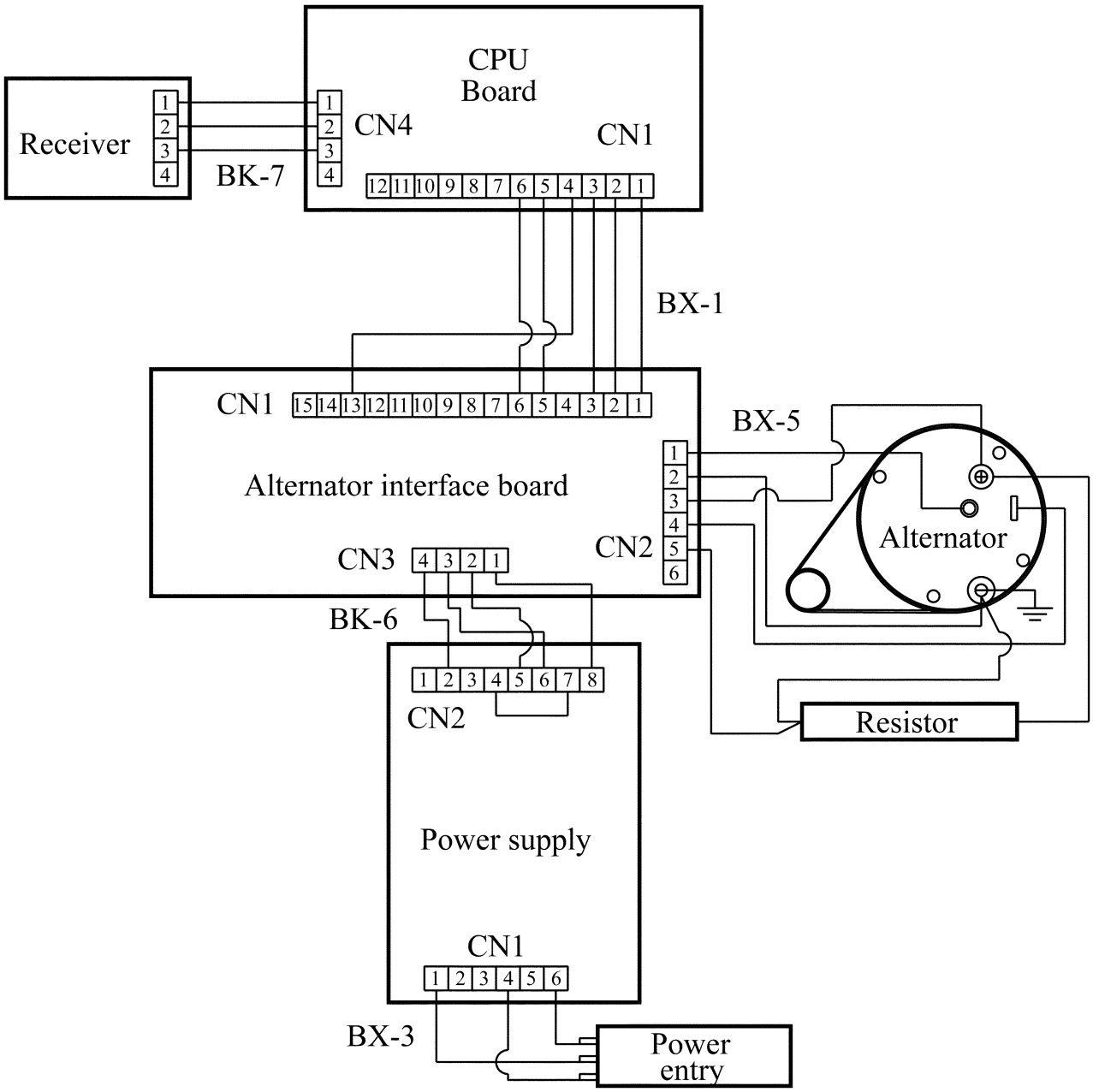
The machine conforms to the following directives:

- EMC Directive 89/336/EEC.
- LVD Directive 73/23/EEC and 93/68/EEC.

And is therefore certified with the EC Mark.

The US version of the machine conforms to the UL 2601 standard.

2.5. WIRING DIAGRAM



2.5.1. CONNECTORS

- CPU board

name	type of connector	connection
CN1	AMP MATE-N-LOCK 12-pin F.	to alternator interface board
CN4	AMP MODU II 4-pin M.	to cardio receiver

- Power supply

name	type of connector	connection
CN1	PANDUIT 6-pin	to mains electricity supply
CN2	PANDUIT 8-pin	to alternator interface board

- Alternator interface board

name	type of connector	connection
CN1	AMP MATE-N-LOCK 15-pin F.	to CPU circuit board
CN2	AMP MATE-N-LOCK 6-pin F.	to alternator
CN3	AMP MODU I 4-pin M.	to power supply

2.5.2. WIRING

BX-1: Internal connecting cable CPU – Alternator interface board			
CPU/CN1	**Signal**	**Color**	**Alternator interf. board/ CN1**
1	+12 V	Red	1
2	+ 5 V	Orange	2
3	ground	Black	3
4	-12 V	Blue	13
5	Alternator RPM X 6	Violet	5
6	Alternator control frequency	Brown	6

On some machines, the signal designated +12 V in the above table is actually 10.5 V.

BK-7: Heart rate display cable CPU – Cardio receiver			
CPU/CN4	**Signal**	**Color**	**Receiver**
1	+5 V	Red	1
2	Pulse per beat	Blue	2
3	ground	Black	3

BK-6: Low voltage supply cable Power supply – Alternator interface board			
Power supply/ CN2	**Signal**	**Color**	**Alternator interf. board/ CN3**
2	+ 5 V	Yellow	4
5	+ 12 V	Red	2
6-7-4	ground	Black	3
8	- 12 V	Blue	1

BX-5: Alternator cable Alternator interface board – Alternator – Resistor				
Alternator interf. board/ CN2	**Signal**	**Color**	**Alternator**	**Resistor**
1	Alternator RPM X 6	Violet	Red eyelet 4	-
2	Resistor -	Blue	Yellow eyelet 6	
		Blue		Yellow eyelet 4
3	Resistor +	Red	Yellow eyelet 6	
		Red		Yellow eyelet 4
5	ground	Black	-	
4	Excitation	Orange	Red Faston	

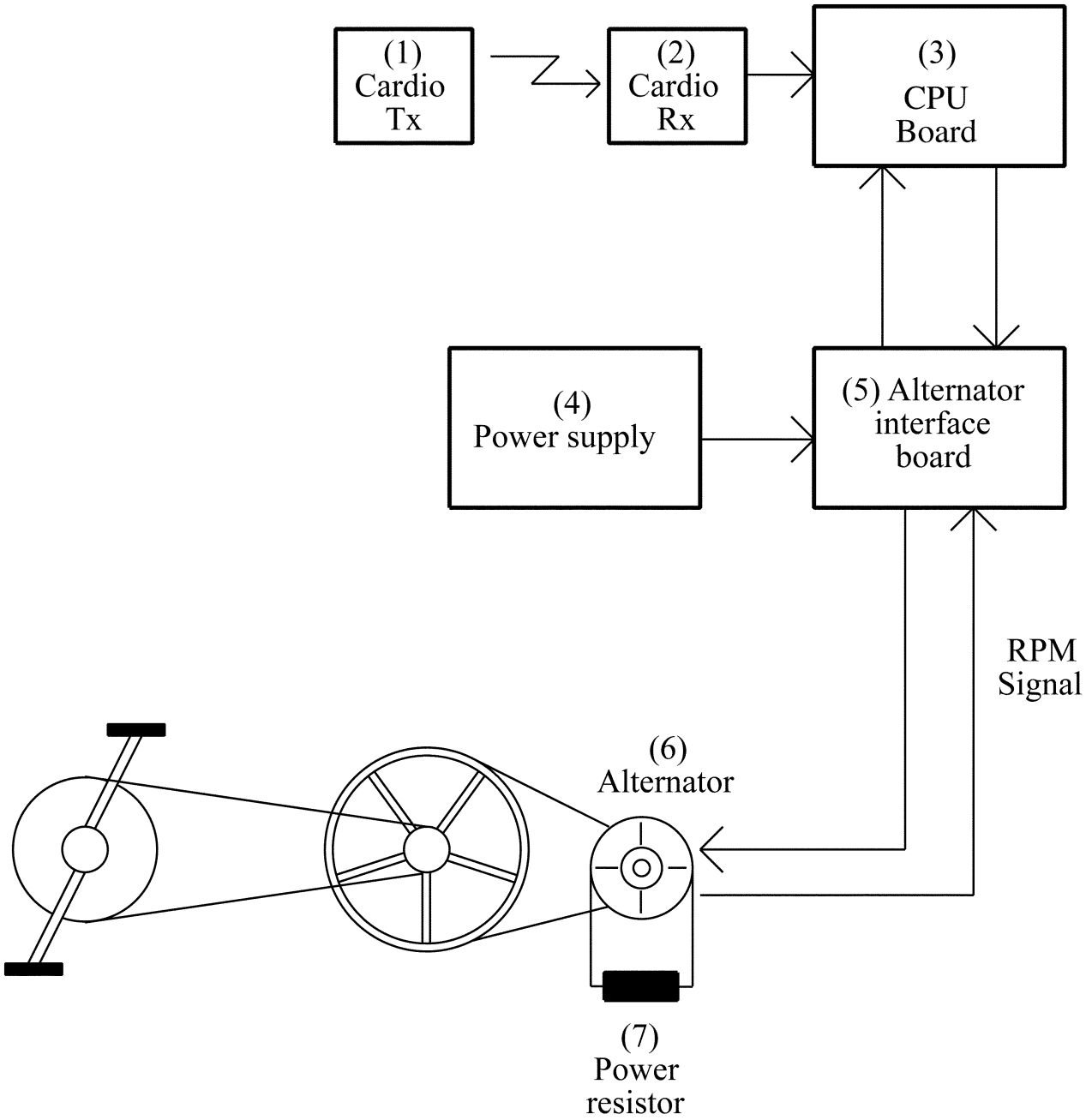
BX-3: High voltage supply cable Power input socket – Power supply			
Power input socket	**Signal**	**Color**	**Power supply CN1**
Yellow Faston	Ground	Yellow	1
Red Faston	Live	Blue	4
Red Faston	Neutral	Black	6

The above description of cable BX-3 is simplified and does not detail the ground node connections.

3. PRINCIPLES OF OPERATION

3.1. BLOCK DIAGRAM

The block diagram of the machine is shown in the figure below:



(1) CARDIO TRANSMITTER

It is worn by the person using the machine, and transmits to the cardio receiver one pulse for every heart beat that is detected.

(2) CARDIO RECEIVER

It is connected to the machine's CPU board and receives the pulses sent by the transmitter. Its reception area is approximately a circle of 1 meter of radius. If there is electromagnetic noise (produced by high voltage lines, radio transmitters, monitors, motors, etc.) within its reception area, the receiver becomes saturated and stops receiving any signal. If there are 2 transmitters within its area of reception, it will receive signals from both, and may produce an error or irregular reading.

(3) CPU BOARD

This is the heart of the machine, which controls all the machine functions according to the instructions of the program stored in EPROM. It receives information from the user (age, weight, etc.) during set-up of the training session, from the cardio receiver (user's heart rate) and from the alternator interface board for displaying workload data (Watt and RPM). It controls the difficulty level selected with the + - keys or according to the chosen training program.

(4) POWER SUPPLY

Receives the mains voltage at its input and outputs the DC voltages (+5 V, +12 V and –12 V) which supply the display and the alternator interface board.

(5) ALTERNATOR INTERFACE BOARD

Receives from the display a square-wave signal whose frequency is proportional to the selected level of difficulty, and converts it into a DC excitation voltage for the alternator. Receives the RPM signal from the alternator, which it filters and sends to the display for calculating the speed of rotation.

(6) ALTERNATOR

Is put into rotation by the user, and generates a resistance to the movement dependent on the excitation voltage which it receives from the alternator interface board. It also generates the RPM signal (6 pulses per revolution) necessary for counting the number of revolutions and hence measuring the speed. Its rotation produces energy which is dissipated by the power resistor.

(7) POWER RESISTOR

Has the function of dissipating the energy produced by the alternator.

4. ACCESSORIES

4.1. CONNECTING TO THE TGS

The machine can be connected to the Technogym System by means of the 9-pin D-type connector situated on the back of the display, which provides the RS 232 serial port for connecting the TGS reader.

The serial port is connected to the CPU by the cable described below, which is supplied in the upgrade kit:

TGSRN2XT: Internal cable CPU – 9 pin connector			
CPU/CN2	**Signal**	**Color**	**DB9 male**
1	+ 12 V	yellow	1
2	Tx	brown	3
5	Rx	white	2
6	ground	green	5

To prevent interference with the cardio receiver, route the cable behind cable BX-1 and connector CN1 of the CPU board.

For all further information, including troubleshooting, refer to the following manual: “Technogym System: Installation Guide”.

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5. INSTALLATION INSTRUCTIONS

5.1. SPECIFICATIONS AND REQUIREMENTS

For correct machine installation, make sure that:

1. The machine is installed on a level surface that is free of vibrations and has sufficient carrying capacity for the combined weight of the machine and user.
2. The environment is dust or sand free.
3. The environment meets the operating temperature and humidity conditions specified in paragraph 2.3. .
4. The machine is not positioned close to sources of heat, sources of electromagnetic noise (television sets, electric motors, antennas, high voltage lines, appliances etc…) or medical equipment.
5. To eliminate any interference with the cardio receiver, there should not be any transmitters at a distance of 100 cm from the display.
6. The mains voltage must match the value specified on the machine rating plate.
7. The electrical system must be provided with an efficient ground connection.
8. The wall output used should be reserved for the machine and have a rating of at least 60 Watt.
9. The machine can be connected in cascade with other machines. It is recommended to connect only machines of the same type in cascade, up to a maximum of 5 machines. In this case, make sure that the wall output has a power rating of at least 300 Watt.
10. Position the mains lead of the machine where is will not be underfoot. For this purpose, it is recommended to use the special trackways supplied with the machine.

5.2. INSTALLATION

To correctly install the machine, proceed as follows:

1. Ensure that the specifications and requirements for installation have been met (see paragraph 5.1.).
2. Remove the machine from its packing materials: one carton fixed to a wooden pallet for overseas shipment, one nylon bag for Italy.
3. Position the machine as specified above, on a level surface that is free of vibrations and has sufficient carrying capacity for the combined weight of the machine and the user.
4. Connect the mains lead to the input socket on the machine.
5. Place the on/off switch in the “0” position.
6. Plug the mains lead into the electrical output.

5.3. FIRST POWER-ON

After completing the installation procedure, the machine is ready to be turned on. To turn on the machine, simply toggle the on/off switch from the 0 position to the 1 position.

When the machine is turned on it will perform a power-on test which:

- sounds the buzzer;
- lights all the LEDs.

At the end of the power-on test the machine enters standby mode, awaiting a keyboard command.

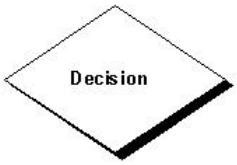
To check the correct operation of the machine:

- get on the machine;
- start exercising;
- check that the RPM display changes accordingly;
- check that the intensity of the exercise varies when the “+” and “–” buttons are pressed, and that the corresponding difficulty level LEDs change accordingly;
- put on the heart rate transmitter and check that the machine correctly measures the heart rate value.

6. TROUBLESHOOTING

The troubleshooting procedures are shown in the form of flow charts. In order to facilitate consultation, the following standard box shapes are used.

This type of box is the START point of the troubleshooting procedure. It typically contains a description of the problem or malfunction.



This type of box represents a decision point in the troubleshooting procedure. It typically contains a description of the CHECK to be made, with an outcome that can be either a positive (YES) or negative (NO) response.

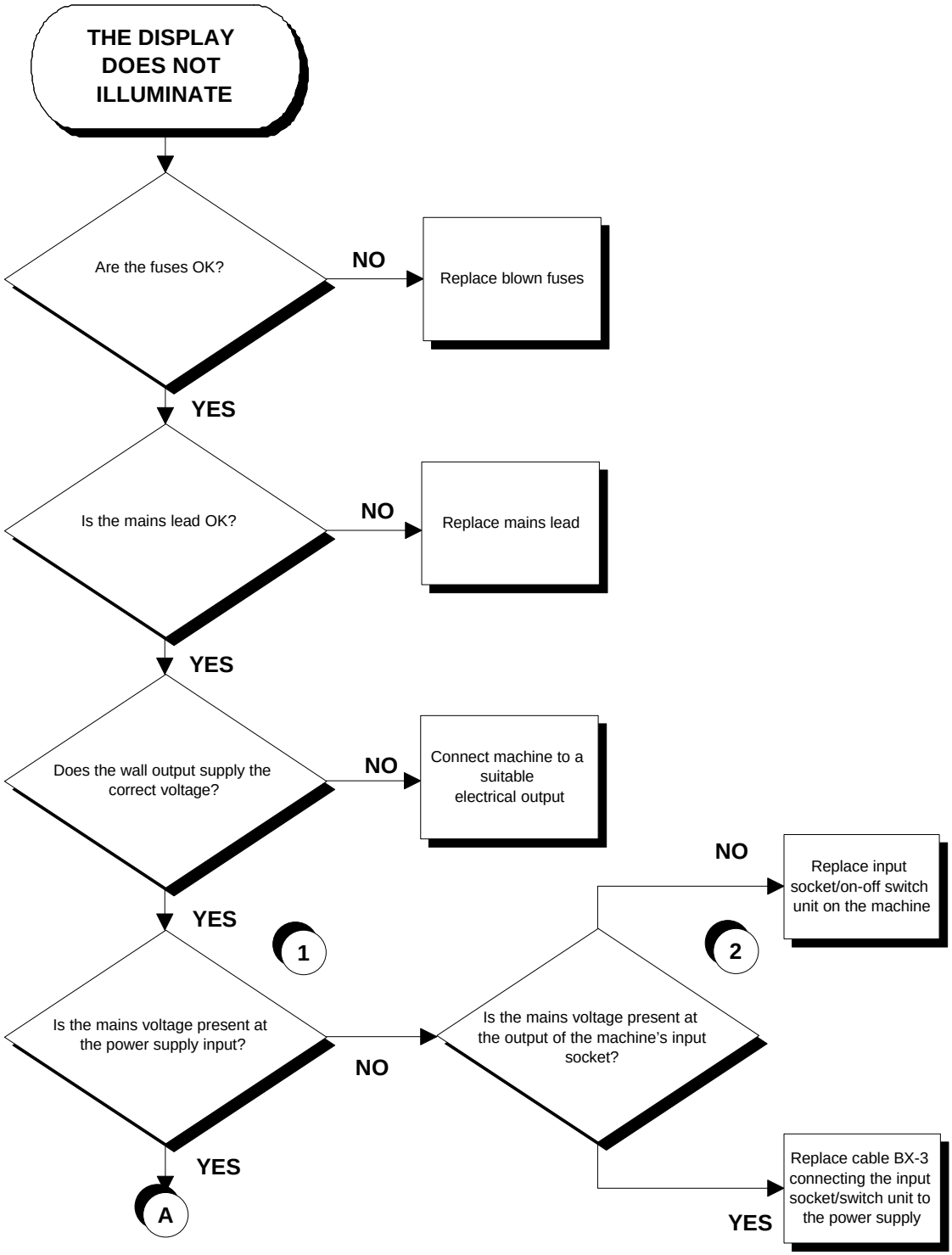
This type of box is a step in the troubleshooting procedure where an ACTION must be carried out. It typically contains a description of the ACTION necessary to resolve the problem. Therefore, after executing the specified ACTION:

1. Check whether the problem has been resolved;
2. If the problem persists, it is recommended to resume the troubleshooting procedure from the point before the action was carried out.

A circled number (such as that shown on the left) next to a box of the troubleshooting procedure indicates that detailed instructions for performing that particular check or action are provided below the flowchart.

A circled letter (such as that shown on the left) is used to highlight a point in the procedure. Typically, this indicator is used in page changes.

6.1. THE DISPLAY DOES NOT ILLUMINATE



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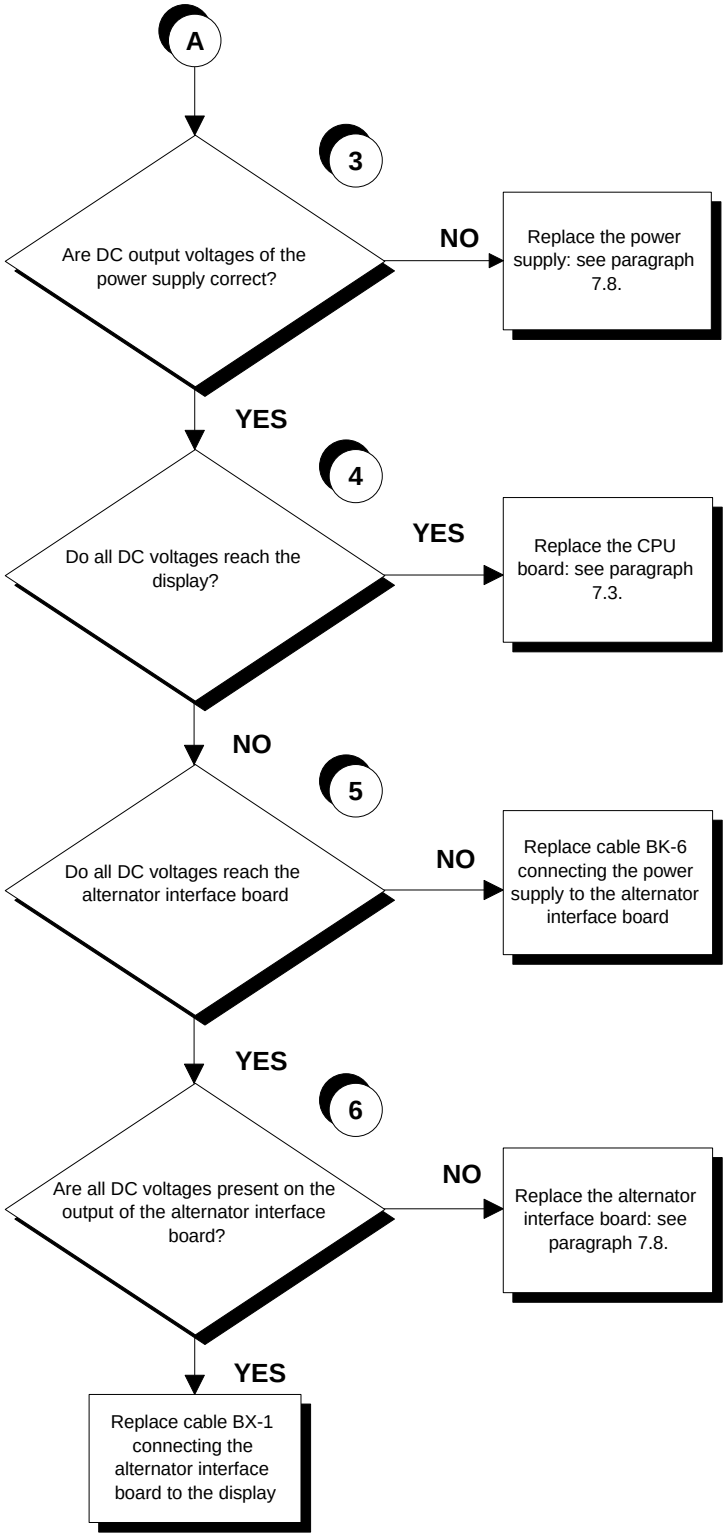


Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

(1) Disconnect connector CN1 from the power supply. Place the tester probes on pins 4 and 6 of the connector. The measured voltage should be approximately 220 VAC or 110 VAC depending on the mains electricity supply.

(2) As for step (1) but with the tester between terminals L1 and N1 of the input socket / on-off switch block.

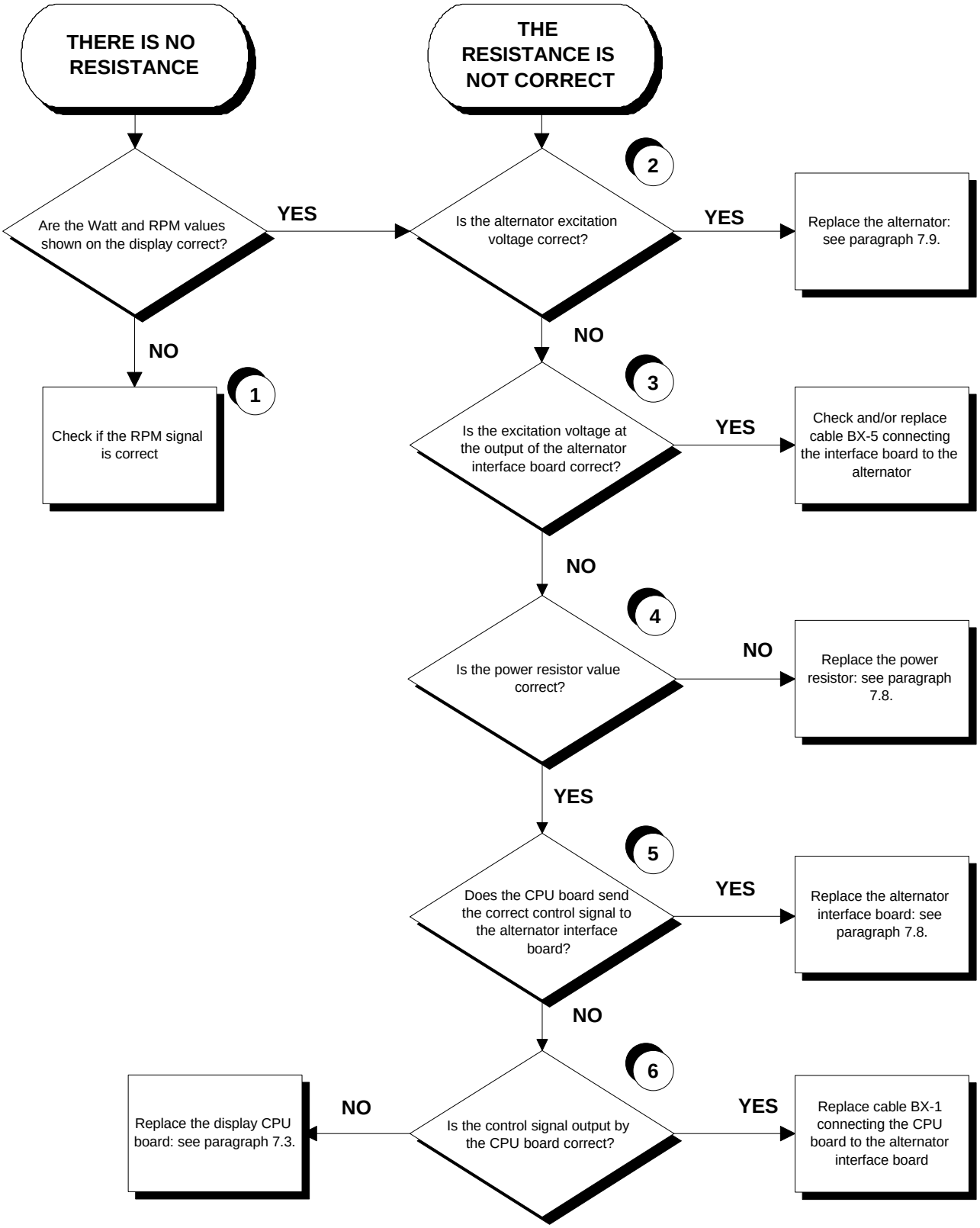
(3) Slightly lift connector CN2 on the power supply to access the pins with the tester probes. Check that all the output voltages of the power supply are correct, referring to 2.5.2. “Wiring diagrams”.

(4) As for step (3) but on connector CN1 of the display CPU board.

(5) As for step (3) but on connector CN3 of the alternator interface board.

(6) As for step (3) but on connector CN1 of the alternator interface board.

6.2. THE RESISTANCE IS NOT CORRECT



Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

(1) Perform the troubleshooting procedure described in paragraph 6.3. “The RPM value is incorrect”.

(2) Place the tester probes between the orange (positive) and black (negative) cables on the alternator. Select the “Manual Training” function on the display and start using the machine. Vary the level of difficulty, while maintaining the speed specified in Table 6.2-1: the excitation voltage should vary as shown in the same table.

RPM = 70	EXCITATION VOLTAGE (VDC)		WAVEFORM FREQUENCY (Hz)	
LEVEL OF DIFFICULTY	ALTERNATOR	ALTERNATOR INTERFACE BOARD		CPU BOARD
		4-5/CN2	6-3/CN1	6-3/CN1
1	1.5	1.5	155	155
3	2.3	2.3	250	250
6	3.2	3.2	360	360
9	4.6	4.6	510	510

Table 6.2-1

Note that the voltages and frequencies specified above are nominal values.

(3) As for point (2) but with the tester between pins 4 (positive) and 5 (negative) of connector CN2 on the alternator interface board.

(4) Disconnect all the cables from the 2 power resistor terminals. Place the tester probes on the 2 terminals and measure the value of the resistance.

OBSERVE: Because all tester probes have a non zero internal resistance, which varies depending on the model and may be in the same order as the quantity being measured, the following procedure is recommended:

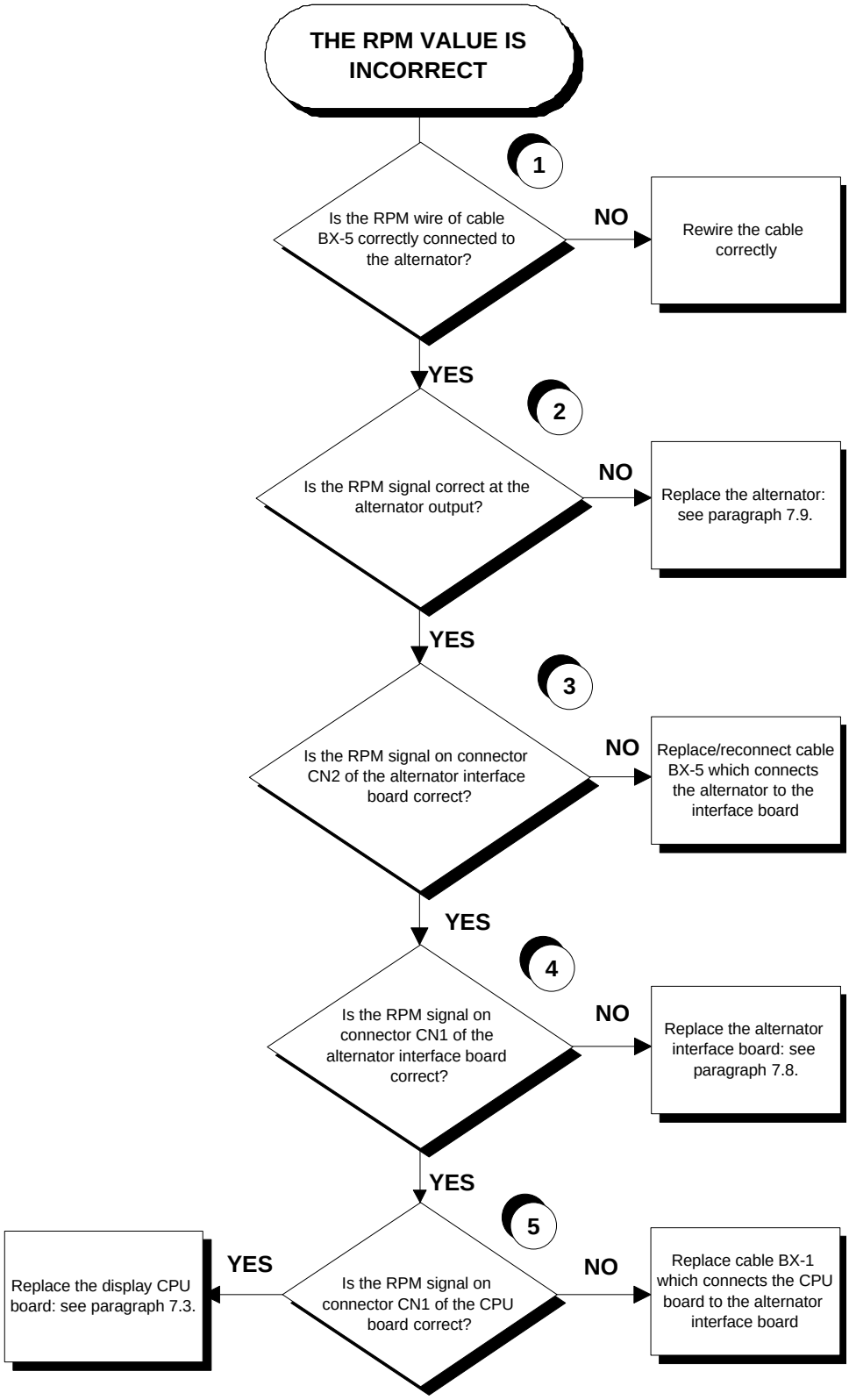
- Measure the internal resistance of the probes by short-circuiting them with each other;
- Measure the resistance of the power resistor. The true resistance value is obtained by subtracting the short-circuit resistance of the probes from the measured value.

The correct value for the power resistor is approximately 0.5 Ω.

(5) As for point (2) but with an oscilloscope (if available) between pins 6 (probe) and 3 (ground) of connector CN1 on the alternator interface board.

(6) As for point (5) but with the oscilloscope between pins 6 (probe) and 3 (ground) of connector CN1 of the display CPU board.

6.3. THE RPM VALUE IS INCORRECT



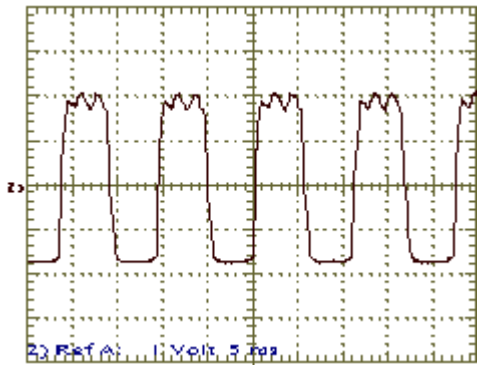
Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

(1) Check whether the black and violet wires, which connect the alternator to pins 1 and 5 of CN2 on the alternator interface board, are correctly connected.

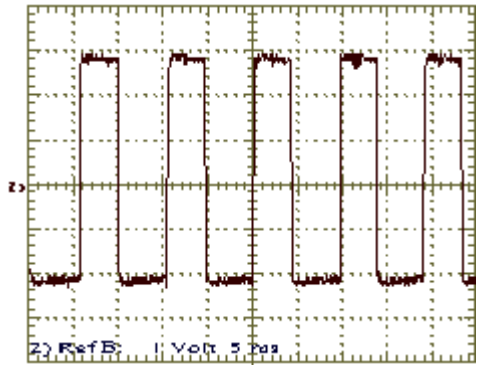
(2) Place the probes of an oscilloscope between the violet wire and the alternator ground. When the speed is varied, the waveform frequency should vary as shown in the table below:

RPM	FREQUENCY (Hz)
60	180
70	210
80	240

The signal at the alternator output and on connector CN2 of the alternator interface board should be as shown below:



while on connectors CN1 of the alternator interface board and CN1 of the CPU board the following square wave should be obtained:

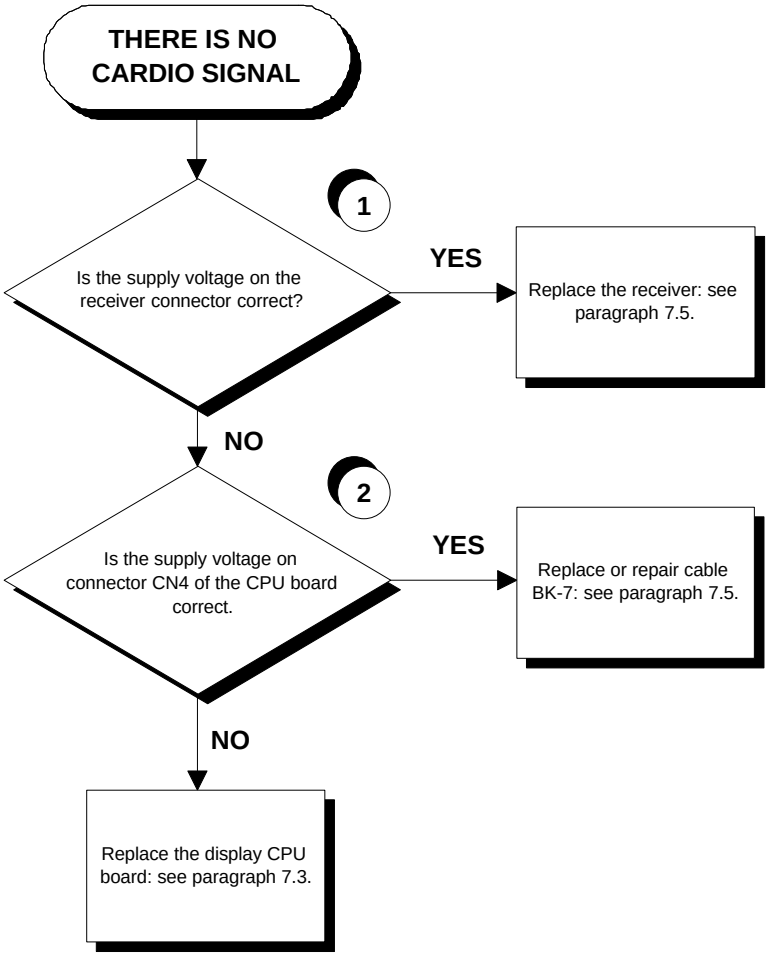


(3) As for step (2) but with the oscilloscope probes between pins 1 (probe) and 5 (ground) of connector CN2 on the alternator interface board.

(4) As for step (2) but with the oscilloscope probes between pins 5 (probe) and 3 (ground) of connector CN1 on the alternator interface board.

(5) As for step (2) but with the oscilloscope probes between pins 5 (probe) and 3 (ground) of connector CN1 on the display CPU board.

6.4. THERE IS NO HEART RATE SIGNAL



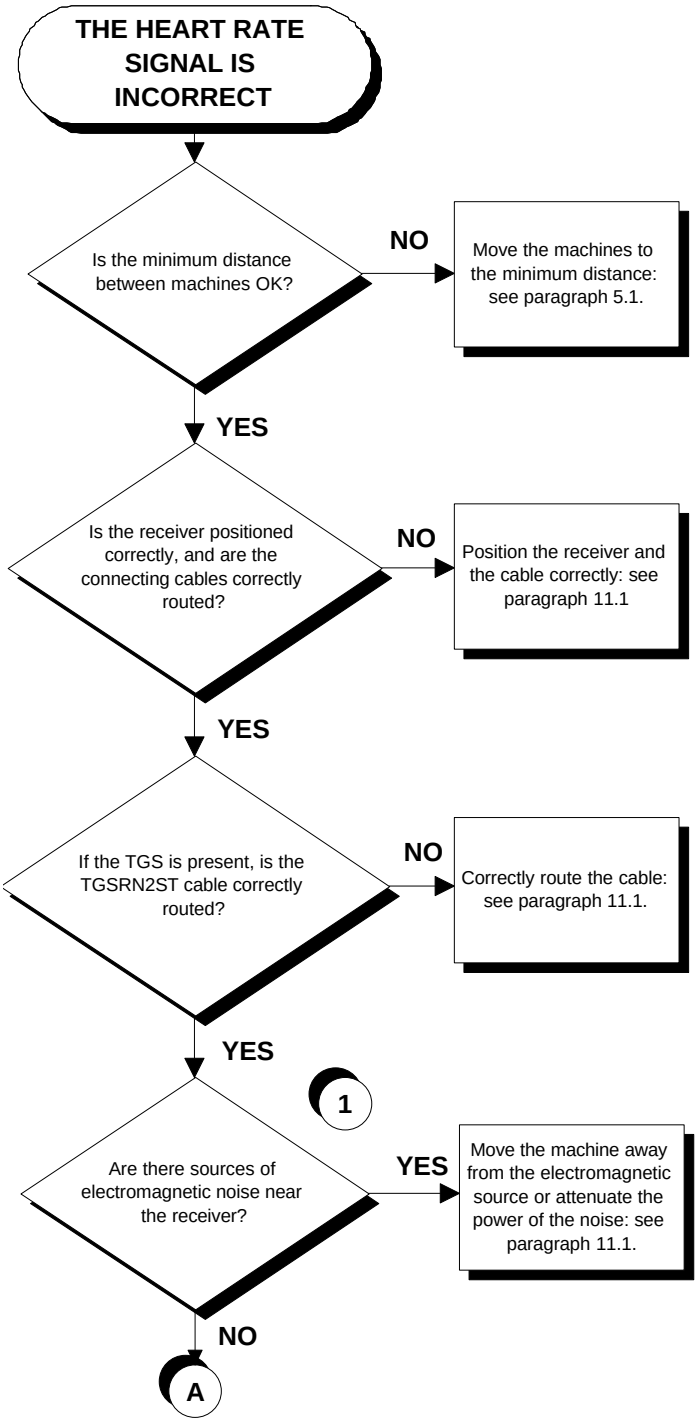
Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

(1) Place the tester probes between pins 1 (signal) and 3 (ground) (corresponding to the red and black wires) of the 4-pin receiver connector: the voltage should be +5Vdc.

(2) Place the tester probes between pins 1 (signal) and 3 (ground) (corresponding to the red and black wires) of connector CN4 on the display CPU board: the voltage should be +5Vdc.

6.5. THE HEART RATE SIGNAL IS INCORRECT

In some case the machine may show “Err” on the heart rate display.



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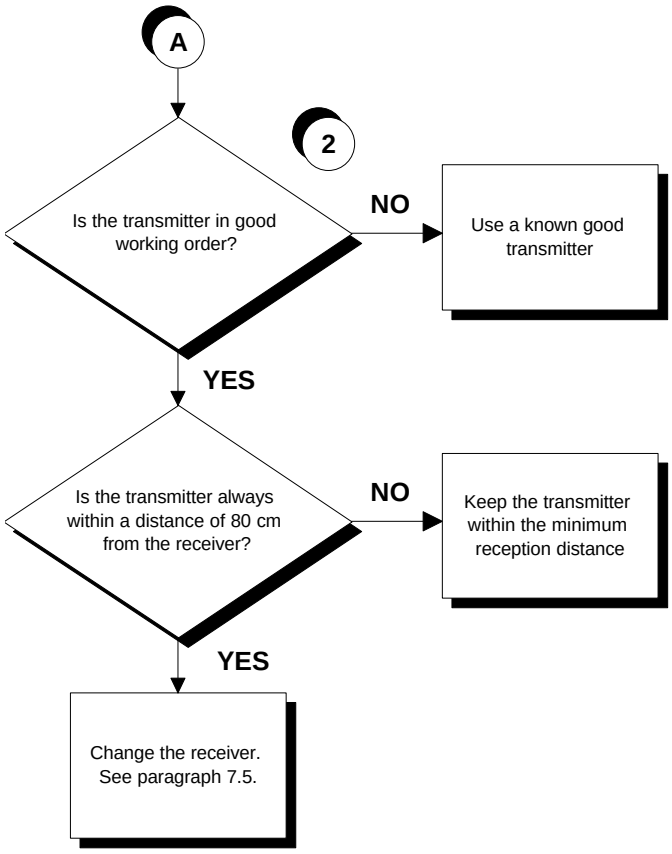
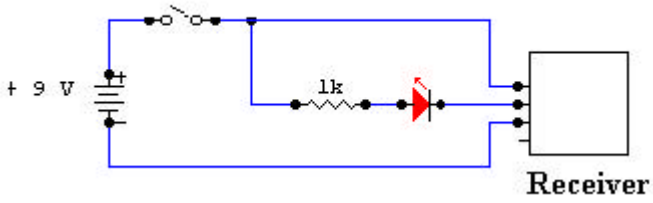


Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by the circled numbers, which are described in detail below:

(1) To check for electromagnetic noise near the machine, use a frequency signal monitor constructed as shown in the schematic below:



The circuit lights the LED for every heart beat and/or disturbance that is received: in this way it possible to determine whether there is any interference, and identify its sources.

(2) Check the battery power level, using a tester if possible. Otherwise use a receiver or another "reference" machine to check operation up to a distance of about 80 cm from the receiver.

Consult paragraph 11.1. "Technical notes on cardio receivers" in the Appendix.

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7. DISASSEMBLY OF COMPONENTS

7.1. DISASSEMBLING THE DISPLAY

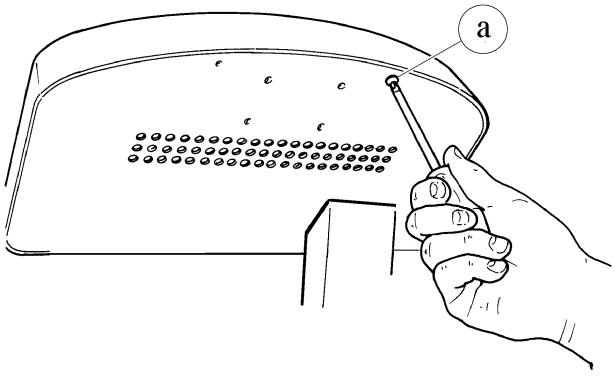

Figure 7.1-1

1. Turn off the machine and unplug the mains lead from the wall output.
2. Remove the 7 self-tapping screws **a** which fix the DISPLAY, using a large Phillips screwdriver.

Support the DISPLAY before removing the last screw.

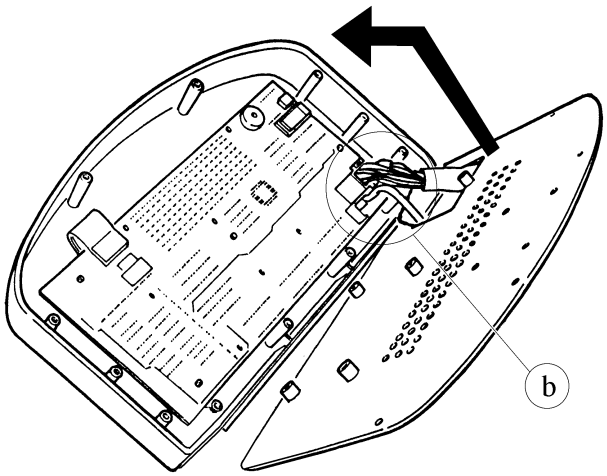

Figure 7.1-2

3. Open the DISPLAY.

To remove the DISPLAY:

1. Disconnect connectors **b**.
2. Remove the DISPLAY.

To reassemble the DISPLAY, carry out the above steps in reverse order.

7.2. DISASSEMBLING THE EPROM

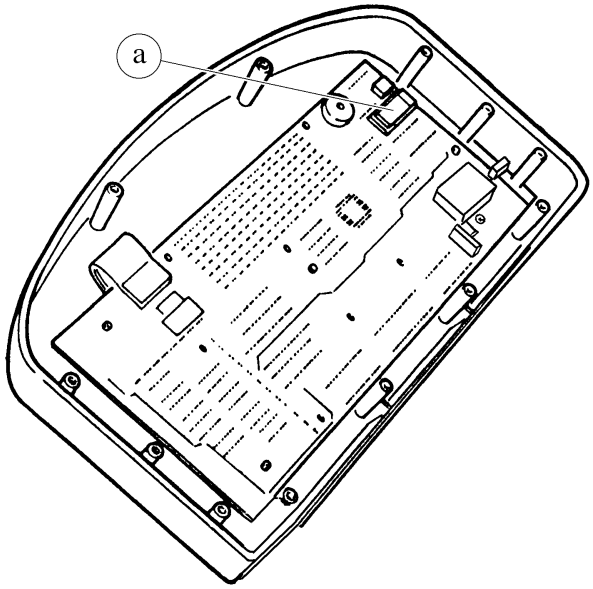

Figure 7.2-1

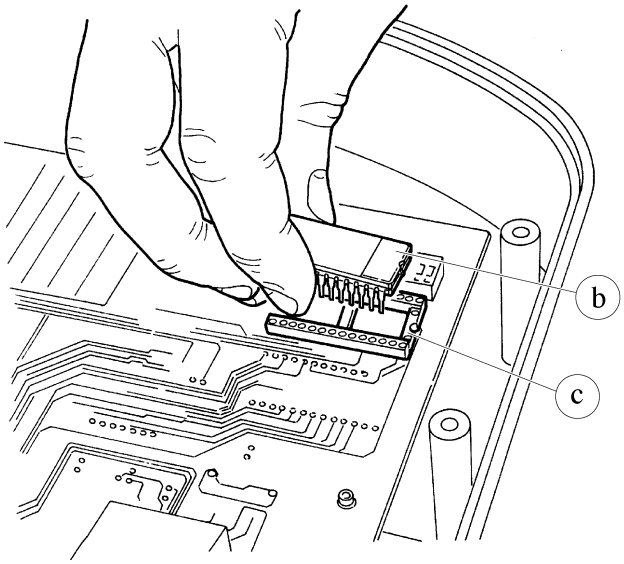

Figure 7.2-2

Carry out the procedure described in paragraph 7.1. “Disassembling the display”.

With the display on a work bench:

1. Remove EPROM **a** from its socket using an integrated-circuit extractor tool.

To reassemble the EPROM:

1. Make sure that reference notch **b** on the EPROM coincides with reference notch **c** on its socket.
2. Be careful to center the EPROM pins above the corresponding holes in the socket.
3. Push the pins into the socket.

The EPROM can be irreversibly damaged if the reference notch on the EPROM is not correctly matched up with the notch on the socket, or if its pins are bent.

7.3. DISASSEMBLING THE CPU BOARD

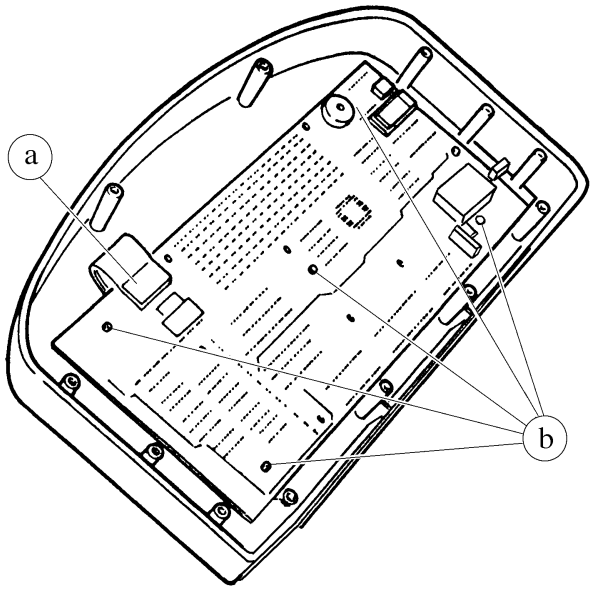

Figure 7.3-1

Carry out the procedure described in paragraph 7.1. “Disassembling the display”.

With the display on a work bench:

1. Disconnect keyboard connector **a**.
2. Unscrew the 5 screws **b**, using a small Phillips screwdriver.
3. Disconnect the cardio receiver connector if it is still connected.
4. Remove the CPU BOARD.

This procedure must be carried out on a work bench.

To reassemble the CPU BOARD, carry out the above steps in reverse order.

7.4. DISASSEMBLING THE KEYBOARD

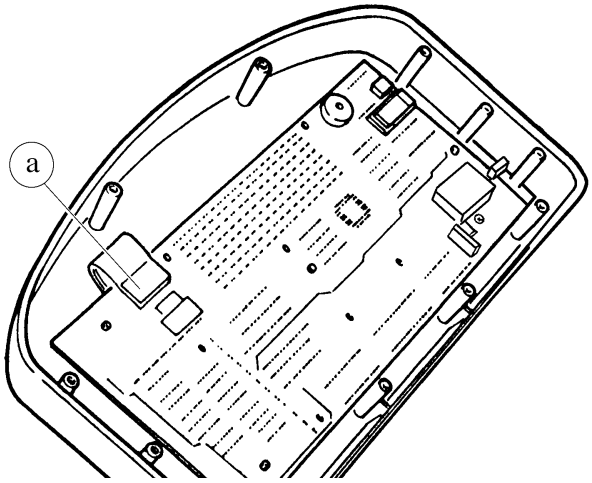

Figure 7.4-1

Carry out the procedure described in paragraph 7.1. “Disassembling the display”.

1. Disconnect KEYBOARD connector **a**.

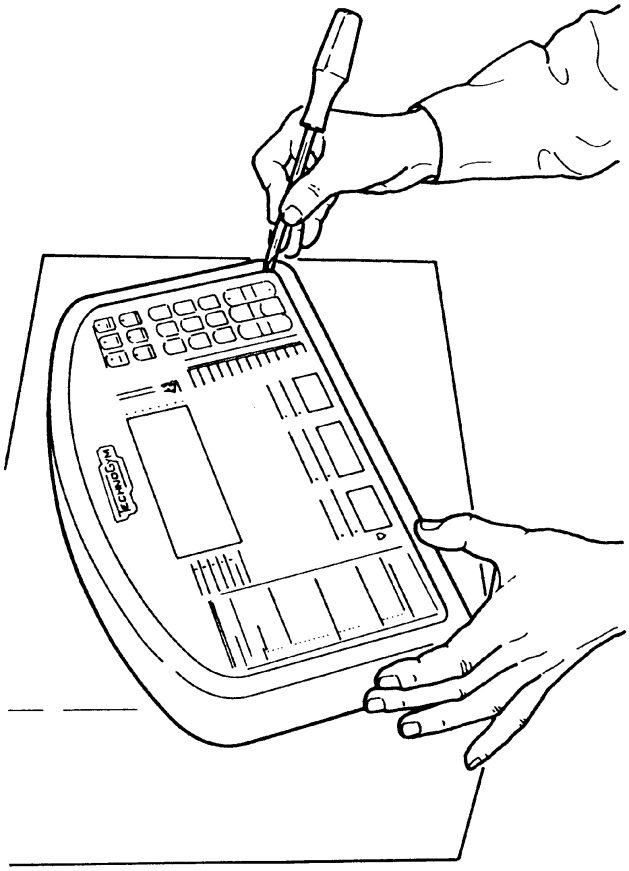

Figure 7.4-2

With the display on a work bench:

2. Use a sharp tool to lift up a corner of the KEYBOARD and detach it.

To reassemble the new KEYBOARD, with the display on a work bench:

1. Remove the backing film from the adhesive.
2. Apply the adhesive part, starting from the left and working towards the right, without folding the KEYBOARD.
3. Insert the connector in the special slot on the display and connect it to the CPU board.
4. Remove the protective film.

When reassembling the keyboard, make sure that none of the keys are bent or remain pushed in.

The KEYBOARD assembly procedure can only be carried out once, because disassembly damages the tracks and keys.

7.5. DISASSEMBLING THE CARDIO RECEIVER

Version A: receiver situated below the display.

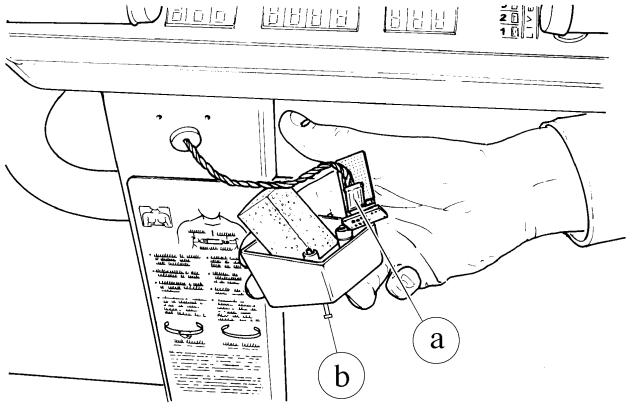

Figure 7.5-1

1. Turn off the machine and unplug the mains lead from the wall output.

2. Remove the label from the CARDIO RECEIVER box using the blade of a screwdriver.
3. Remove the 2 fixing screws **b** using a 3-mm hex T-wrench.
4. Open the box.
5. Disconnect connector **a**.
6. Remove the RECEIVER.

To reassemble the RECEIVER, carry out the above steps in reverse order.

Before securing the screws, make sure the cable is correctly positioned in order to avoid squeezing it.

Version B: receiver situated inside display, secured by a strap.

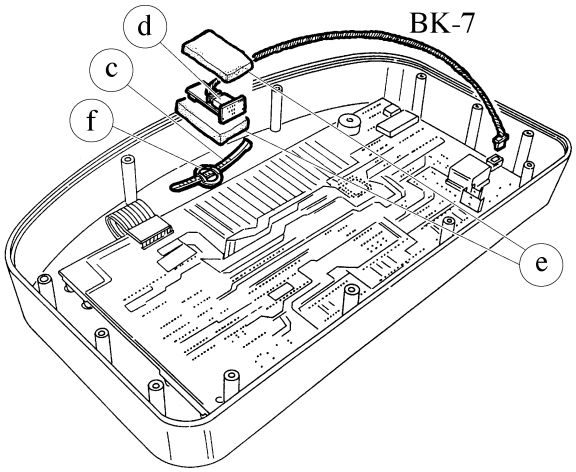

Figure 7.5-2

Carry out the procedure described in paragraph 7.1. “Disassembling the display”.

With the display on a work bench:

1. Cut the fixing strap **c**.
2. Disconnect connector **d** of cable BK-7 from the RECEIVER.

To assemble the new RECEIVER, with the display on a work bench:

1. Connect connector **d** of cable BK-7 to the RECEIVER.
2. Position the RECEIVER between the foam pads **e** as shown in the figure at left.
3. Passing the strap through clamp **f**, fix and secure with the strap.

Version C: receiver housed in a box inside the display.

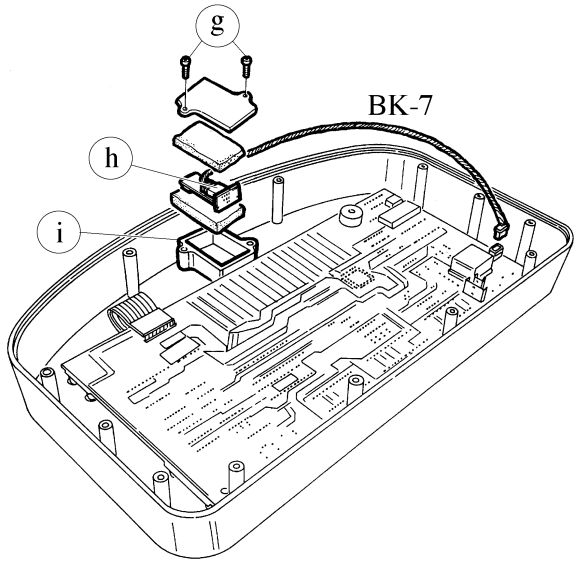

Figure 7.5-3

Carry out the procedure described in paragraph 7.1. “Disassembling the display”.

With the display on a work bench:

1. Unscrew the 2 screws **g** on RECEIVER housing box **i** using a small Phillips screwdriver.
2. Disconnect connector **h** of cable BK-7 from the RECEIVER.

To reassemble the new RECEIVER, with the display on a work bench:

3. Connect connector **h** of cable BK-7 to the RECEIVER.
4. Position the RECEIVER in the box as shown in the figure at left.
5. Lock down the 2 screws **g** of the RECEIVER housing box.

WARNING: put the receiver and route the cables as described in paragraph 11.1. “Technical notes on cardio receivers”.

7.6. DISASSEMBLING THE SADDLE STEM GUARD

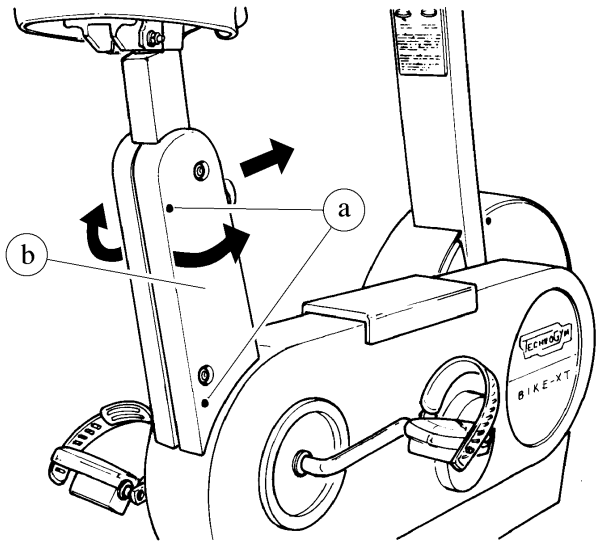

Figure 7.6-1

1. Turn off the machine and unplug the mains lead from the wall output.

2. Unscrew the 2 Allen screws **a** using a 4-mm hex T-wrench.
3. Remove the SADDLE STEM GUARD **b**.

To reassemble the SADDLE STEM GUARD, carry out the above steps in reverse order.

7.7. DISASSEMBLING THE RIGHT AND LEFT SIDE CASINGS

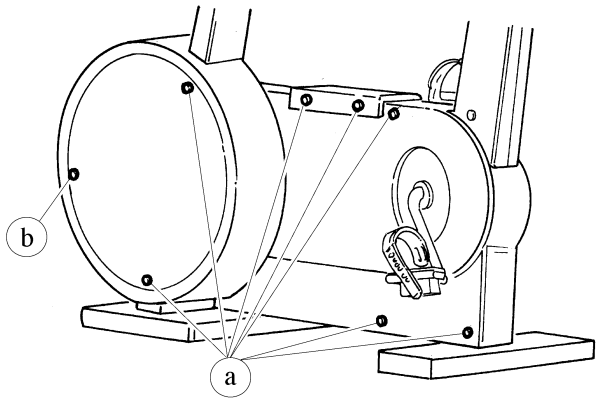

Figure 7.7-1

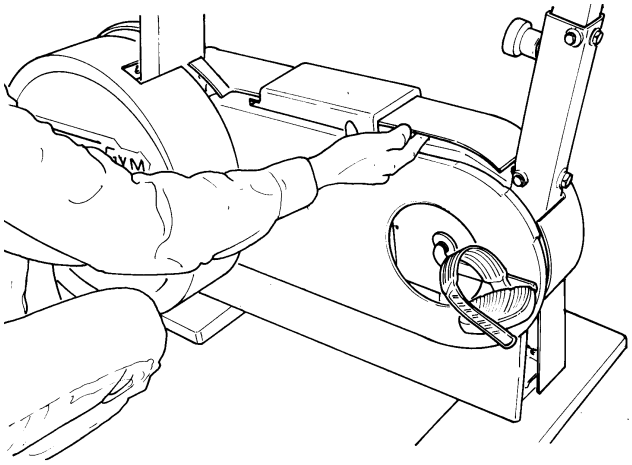

Figure 7.7-2

Carry out the procedure described in paragraph 7.6. “Disassembling the saddle stem guard”.

1. Unscrew the 7 self-tapping screws **a** which fix the LEFT SIDE CASING using a large Phillips screwdriver.
2. Remove screw **b** using a large Phillips screwdriver, while using another large Phillips screwdriver to hold the opposing screw on the RIGHT SIDE CASING in place.

3. Unscrew the 7 self-tapping screws which fix the RIGHT SIDE CASING using a large Phillips screwdriver.

4. Push the right pedal toward the rear of the machine and remove the RIGHT SIDE CASING, using your right hand to help separate the 2 SIDE CASINGS.

Place your hand exactly as shown in the figure at left

5. Push the left pedal towards the back of the machine and remove the LEFT SIDE CASING.

To reassemble the SIDE CASINGS, carry out the above steps in reverse order.

It is also possible to disassemble only one of the 2 SIDE CASINGS.

7.8. DISASSEMBLING THE ELECTRONIC CIRCUIT BOARDS

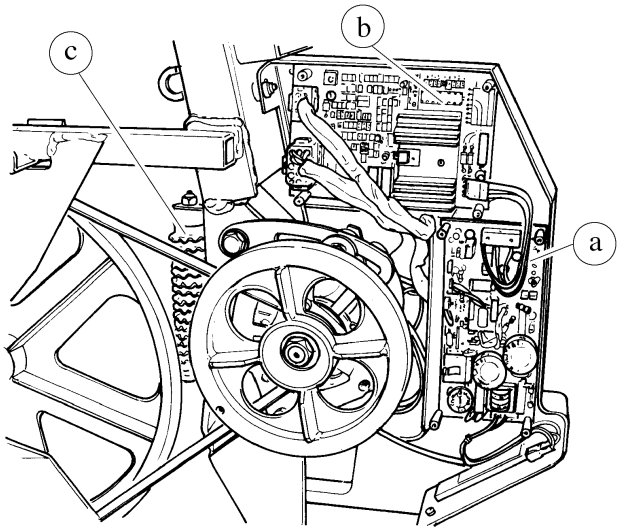

Figure 7.8-1

Carry out the procedure described in paragraph 7.7. “Disassembling the right and left side casings”, removing only the right side casing.

1. Use a 7-mm wrench to unscrew the hexagonal-head fixing screws of the grid which protects the electronic circuit boards.
2. Remove the protection grid.

To disassemble POWER SUPPLY **a**:

1. Disconnect the 2 connectors CN1 and CN2.
2. Remove the fixing screws on the plate support using a 7-mm socket wrench.
3. Manually unscrew the fixing studs on the plate support.
4. Remove the circuit board.

To disassemble ALTERNATOR INTERFACE BOARD **b**:

1. Disconnect the 3 connectors CN1, CN2 and CN3.
2. Unscrew the fixing screws on the plate support using a 7-mm socket wrench.
3. Manually unscrew the fixing studs on the plate support.
4. Remove the circuit board.

To disassemble POWER RESISTOR **c**:

1. Unscrew the 2 locknuts on cable BX-5 using a 7-mm wrench.
2. Unscrew the 2 locknuts on the resistor using a 10-mm wrench.
3. Remove the resistor.

To reassemble the ELECTRONIC CIRCUIT BOARDS, carry out the above steps in reverse order.

7.9. DISASSEMBLING THE ALTERNATOR

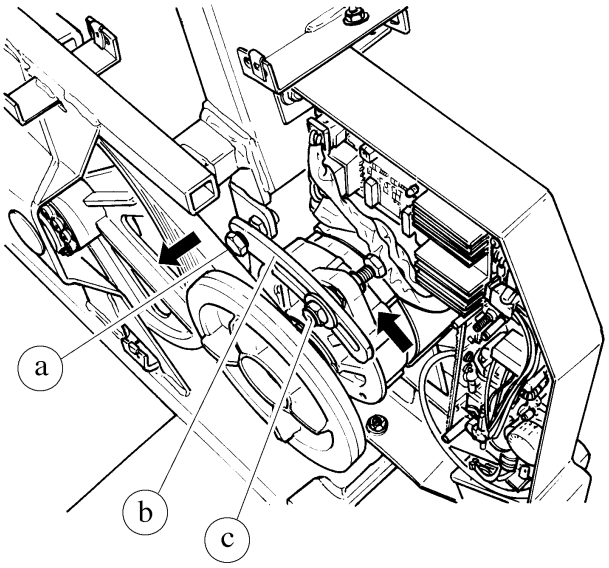

Figure 7.9-1

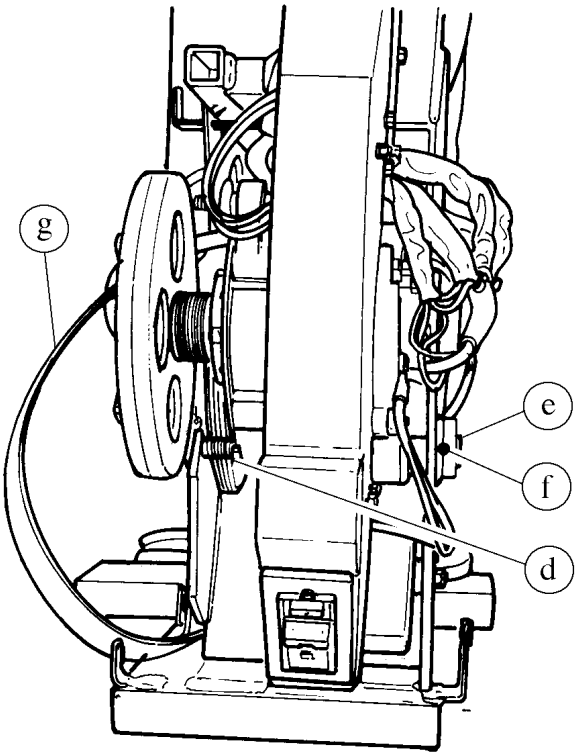

Figure 7.9-2

Carry out the procedure described in paragraph 7.7. “Disassembling the right and left side casings”.

1. Disconnect the cables from the ALTERNATOR.
2. Loosen nut **c** of belt tension rod **b** using a 17-mm wrench.
3. Unscrew bolt **a** which fixes belt tension rod **b** to the machine frame using a 17-mm wrench.

4. Loosen dowel **f** using a 4-mm hex T- wrench.

5. Move the ALTERNATOR until belt **g** can be removed.

To facilitate the operation, the belt can first be removed from the pulley.

6. Loosen lock nut **d** of alternator pivot **e** using a 19-mm wrench.
7. Unscrew alternator pivot **e** using an 8-mm hex T wrench. At the same time, back off lock nut **d** until it is disassembled.

8. Remove the ALTERNATOR.

To reassemble the ALTERNATOR, carry out the above steps in reverse order.

After completing the procedure, adjust the belt tension and alignment as described in paragraphs 8.1. 8.2. .

7.10. DISASSEMBLING THE BELT

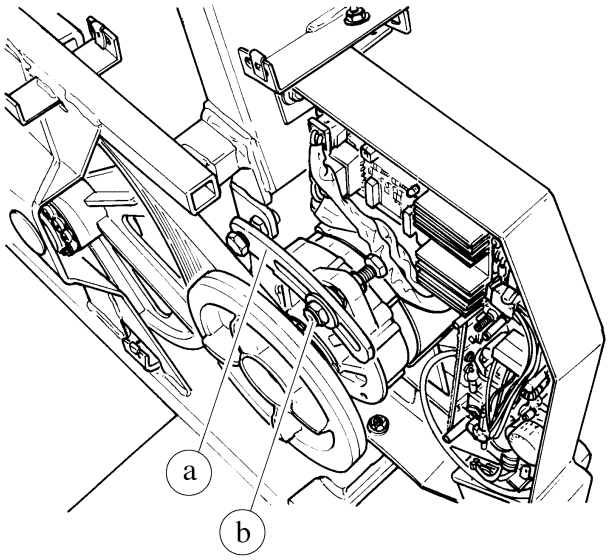

Figure 7.10-1

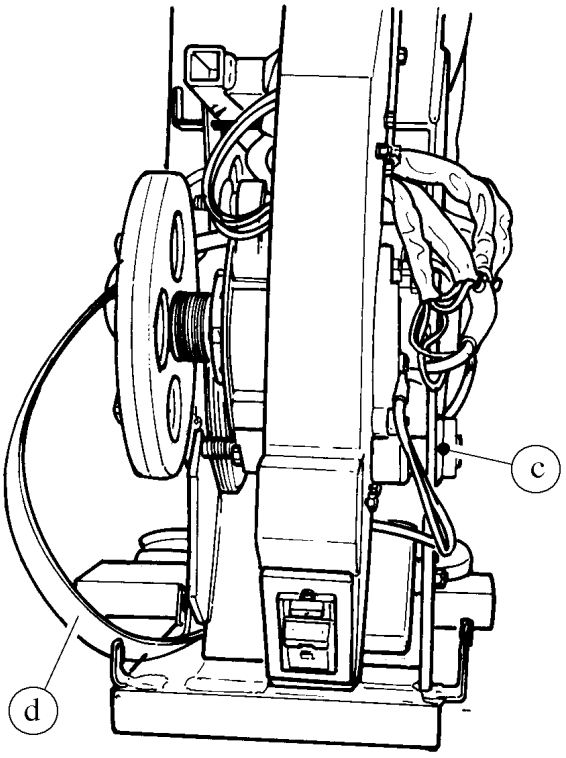

Figure 7.10-2

Carry out the procedure described in paragraph 7.7. “Disassembling the right and left side casings”.

1. Back off nut **b** of belt tension rod **a** using a 17-mm wrench.

2. Back off dowel **c** with a 4-mm hex T-wrench.
3. Move the alternator until BELT **d** can be removed.

To facilitate the operation, the belt can first be removed from the pulley.

Continued on following pages →

Version A:

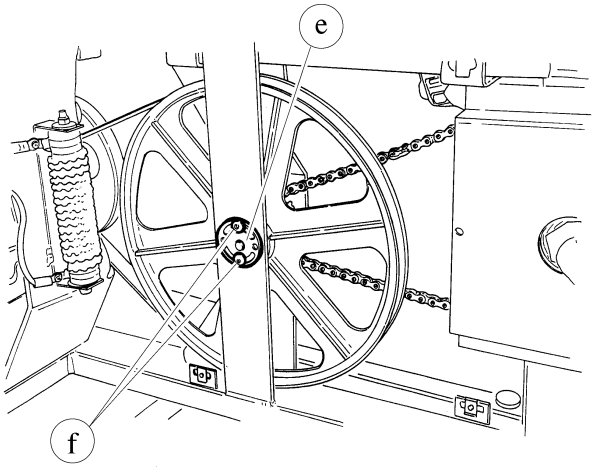

Figure 7.10-3

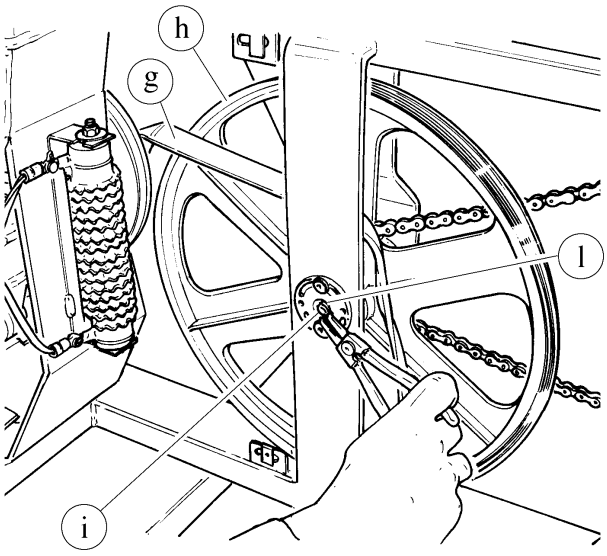

Figure 7.10-4

From the left-hand side of the machine:

4. Use a marker pen to fix a reference point between cam **e** and the machine frame.
5. Unscrew the 2 screws **f** which clamp cam **e** on the frame using a 4-mm hex T wrench.
6. Remove cam **e**.

7. Remove BELT **g** from the guide of pulley **h**.

8. Remove snap ring **i** using the special pliers.

9. Use a pointed tool to push pin **l** inward, taking care to recover the Teflon spacer and the washers if present, until there is sufficient space for the BELT to pass through.

10. Remove the BELT.

To reassemble the BELT, carry out the above steps in reverse order.

After completing the procedure, adjust the alignment and tension of the belt as instructed in paragraphs 8.1. 8.2. .

Version B:

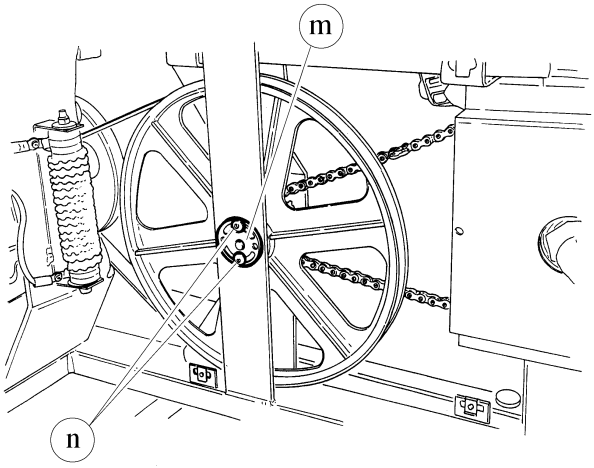

Figure 7.10-5

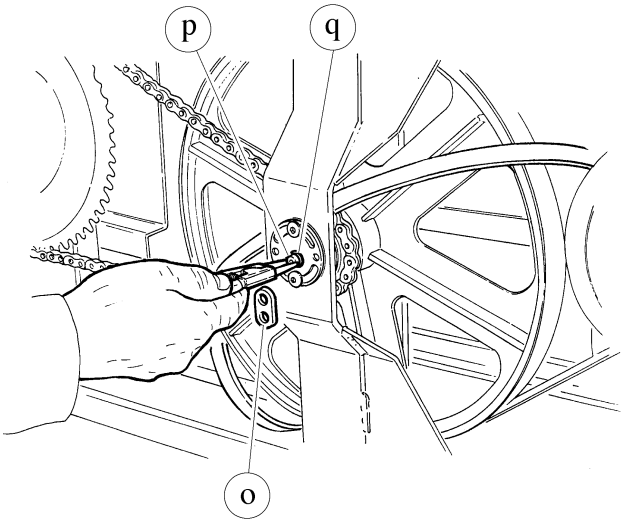

Figure 7.10-6

From both sides of the machine:

4. Use a marker pen to fix a point of reference between cam **m** and the machine frame.
5. Unscrew the 2 screws **n** fixing the cam to the frame using a 4-mm hex T wrench.

6. Disassemble the left hand cam.

The 2 cams are different: the one on the left is threaded, the one on the right is not.

Working from the right side:

7. Remove bracket **o** which clamps adjuster pin **p**.
8. Use a 4-mm hex T wrench to unscrew adjusting pin **p** until the right-hand cam comes out.
9. Remove snap ring **q** using the special pliers.
10. Push the pin toward the left until there is enough space for the BELT to pass through.

11. Remove the BELT.

To reassemble the BELT, follow the above steps in reverse order.

After completing the procedure, adjust the alignment and tension of the belt as instructed in paragraphs 8.1. 8.2. .

7.11. DISASSEMBLING THE PEDAL CRANK GROUP

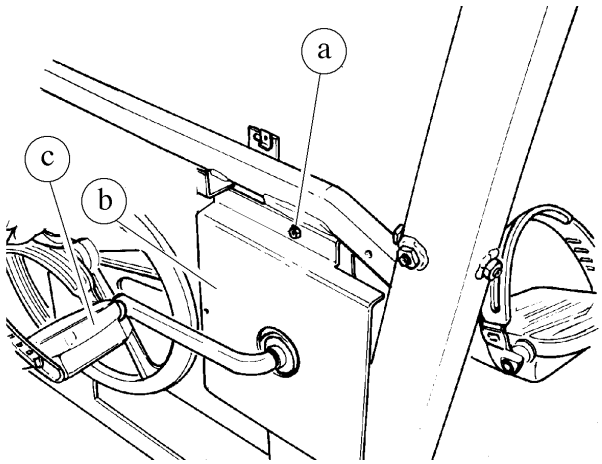

Figure 7.11-1

Carry out the procedure described in paragraph 7.7. “Disassembling the right and left side casings”.

1. Unscrew the left pedal **c** using a 15-mm wrench.
2. Unscrew the fixing screws **a** of plate **b** using an 8-mm wrench.
3. Remove the plate.
4. Open or unsprocket the chain.

Move the pulley cams to facilitate the operation.

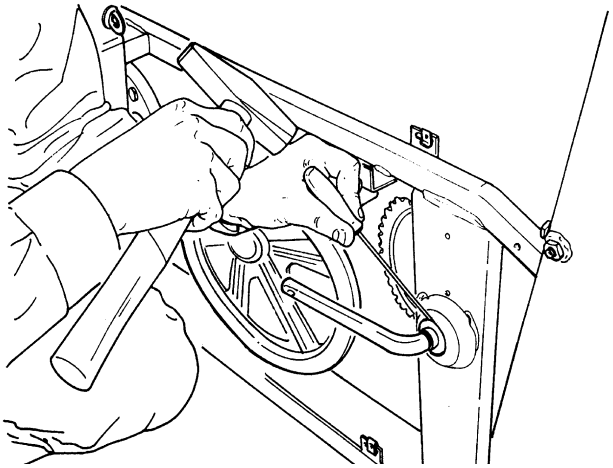

Figure 7.11-2

5. Using a hammer and screwdriver, open the locking tabs to release the left ring nuts of the pedal crank group from the snap ring clamps.

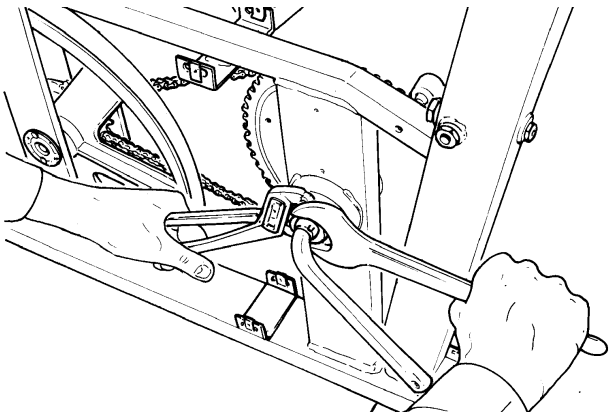

Figure 7.11-3

6. Unscrew the ring nuts as shown in the figure at left, using 36-mm wrenches.
7. Use an extractor to remove the left-hand bearing.
8. Remove the pedal crank from the right side.

Because the threads of the left pedal and ring nuts are inverted, these components must be unscrewed in a clockwise direction.

To reassemble the PEDALS, carry out the above steps in reverse order.

7.12. DISASSEMBLING THE ALTERNATOR BRUSHES

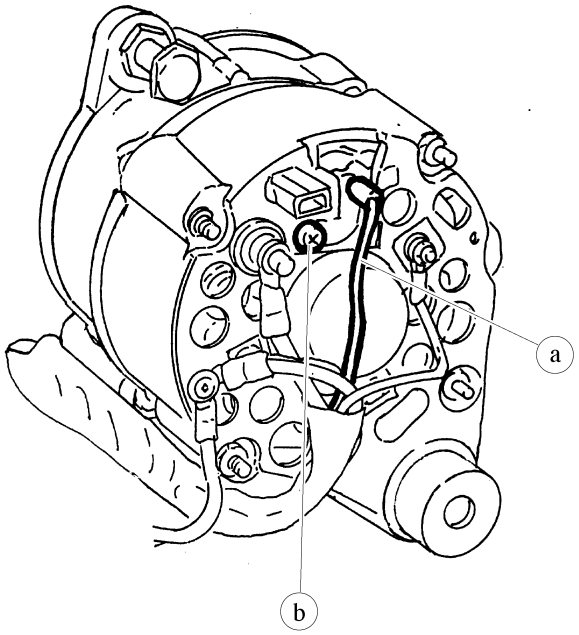

Figure 7.12-1

Carry out the procedure described in paragraph 7.7. “Disassembling the right and left side casings” for the left side casing only.

1. Disconnect cable **a** from the alternator
2. Unscrew BRUSH group fixing screw **b** using a medium Phillips screwdriver.
3. Remove the BRUSHES.

To reassemble the BRUSHES, carry out the above steps in reverse order.

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8. ADJUSTMENTS

8.1. BELT ALIGNMENT

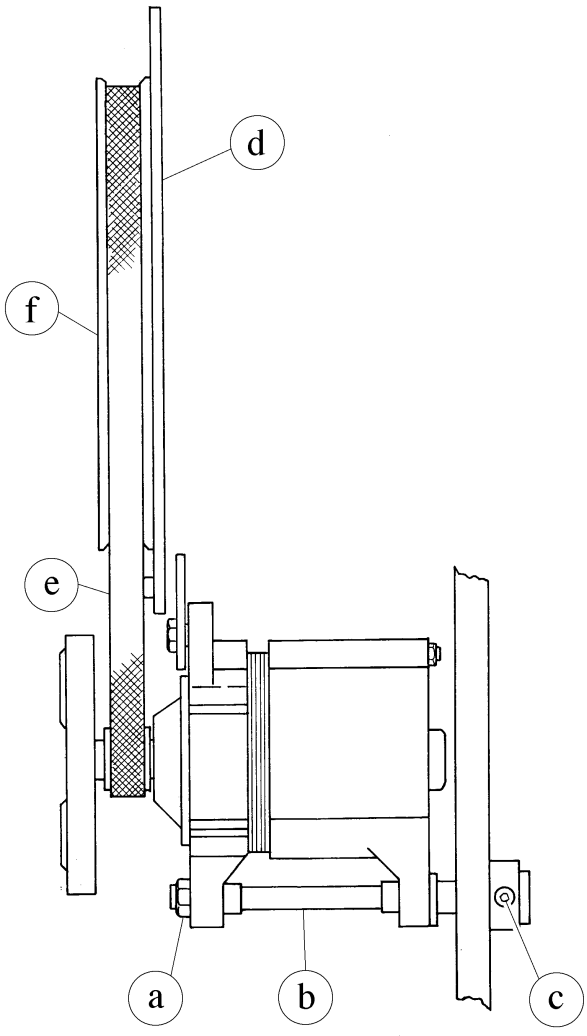

Figure 8.1-1

Carry out the procedure described in paragraph 7.7. “Disassembling the right and left side casings”.

1. Back off lock nut **a** on alternator pivot **b** using a 19-mm wrench.
2. Back off locking dowel **c** of alternator pivot **b** using a 4-mm hex T wrench.
3. Placing a straight reference rod **d** against pulley **f**, verify the alignment of belt **e** by checking that the reference rod **d** is parallel with belt **e**.
4. Adjust alternator pivot **b:** screwing or unscrewing causes the alternator to move forward or backward along the pivot axis.
5. After completing the adjustment, lock down dowel **c** on alternator **b** and tighten lock nut **a**.

After completing this procedure, check the belt tension as described in paragraph 8.2.

8.2. BELT TENSION

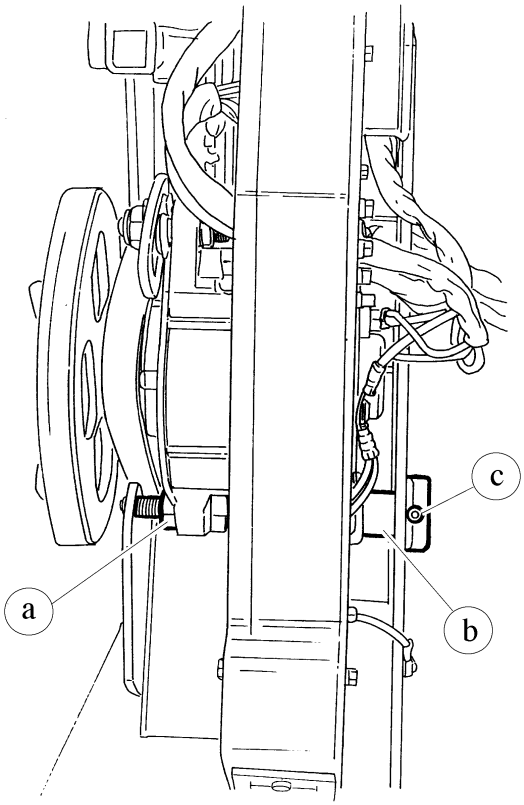

Figure 8.2-1

Carry out the procedure described in paragraph 7.7. “Disassembling the right and left side casings”.

1. Back off lock nut **a** of alternator pivot **b** using a 19-mm wrench.
2. Back off dowel **c** of alternator pivot **b**.

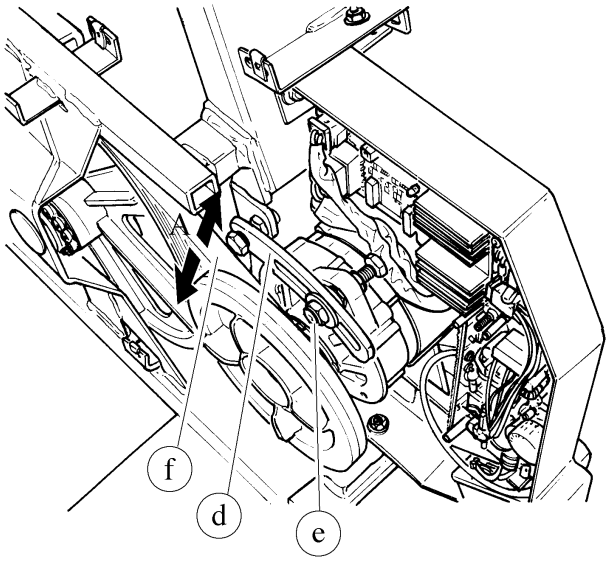

Figure 8.2-2

3. Back off nut **e** of belt tension rod **d** using a 17-mm wrench.
4. Rotate the alternator on its pivot axis in such a way that, at point **A,** belt **f** has a vertical play of approximately 1 cm.

After completing this operation, check the belt tension again.

8.3. CHAIN ALIGNMENT

Version A:

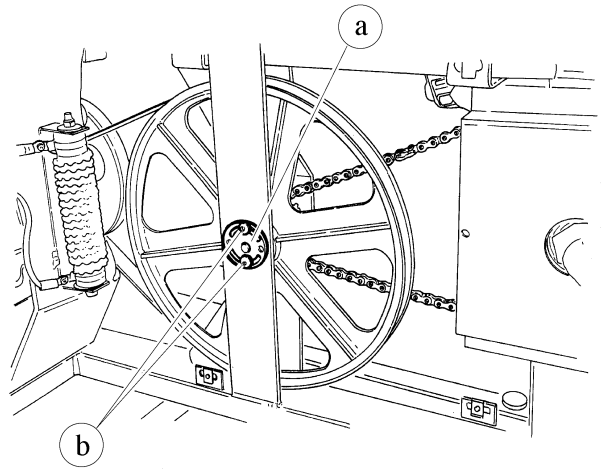

Figure 8.3-1

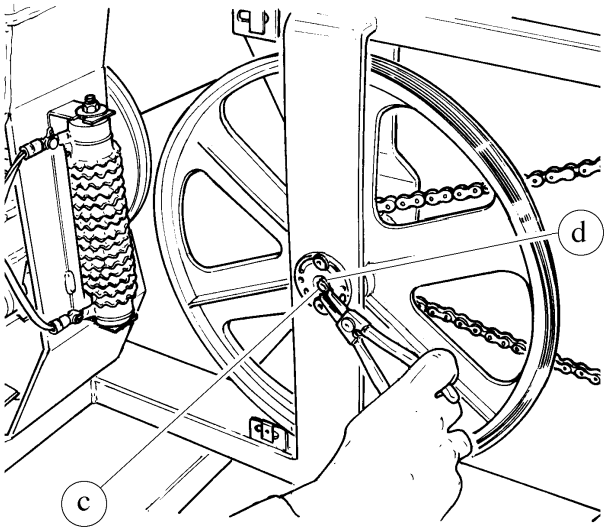

Figure 8.3-2

Carry out the procedure described in paragraph 7.7. “Disassembling the right and left side casings”.

1. From both sides of the machine, use a marker pen to fix a reference point between cam **a** and the frame.

Working from the left-hand side:

2. Unscrew the 2 screws **b** which clamp cam **a** to the frame using a 4-mm hex T wrench.

3. Remove snap ring **c** using the special pliers.
4. Remove the cam.

5. Use a pointed tool to push pin **d** inward until the spacers come out, being careful to recover the Teflon spacer and the washers if present.

6. Move the spacers from one side to the other to align the chain.

To ensure correct alignment of the chain, move it back and forth and make sure that there is no noise.

After completing this procedure, check the chain tension as described in paragraph 8.4.

Version B:

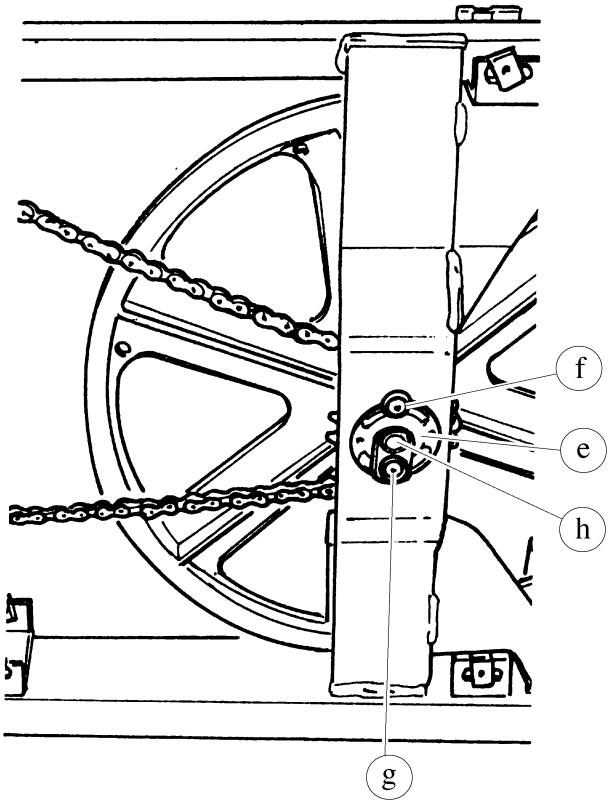

Figure 8.3-3

Carry out the procedure described in paragraph 7.7. “Disassembling the right and left side casings”.

Working from the right-hand side:

1. Disassemble locking bracket **g**.
2. Using a 4-mm hex T wrench, rotate pivot **h** in a clockwise or anticlockwise direction to shift the pulley to the left or to the right.

To ensure correct alignment of the chain, move it back and forth and make sure that there is no noise.

After completing this procedure, check the chain tension as instructed in paragraph 8.4. .

8.4. CHAIN TENSION

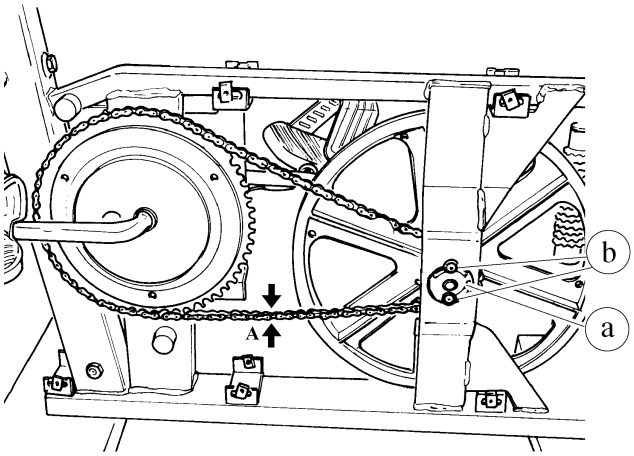

Figure 8.4-1

Carry out the procedure described in paragraph 7.7. “Disassembling the right and left side casings”.

From both sides of the frame:

1. Back off the 2 screws **b** which fix cam **a** onto the frame using a 4-mm hex T wrench.

2. Turn the cams in a clockwise or anticlockwise direction to loosen or tighten the chain, until the vertical play at point **A** is approximately 1 cm.
3. Check the amount of play at point **A** for different pedal positions.

4. Lock down screws **b** from both sides of the frame.

After completing the procedure, check the alignment of the chain as described in paragraph 8.3. and check the belt tension as described in paragraph 8.2.

8.5. PLAY OF SADDLE STEM

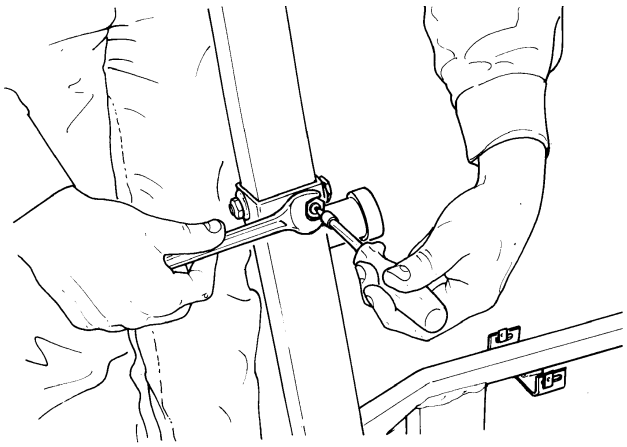

Figure 8.5-1

Carry out the procedure described in paragraph 7.6. “Disassembling the saddle stem guard”.

1. Back off the locking nut using a 17-mm wrench.
2. Regulate the amount of play with the adjusting screws, using a flat-head screwdriver.

8.6. WEAR OF BRUSHES

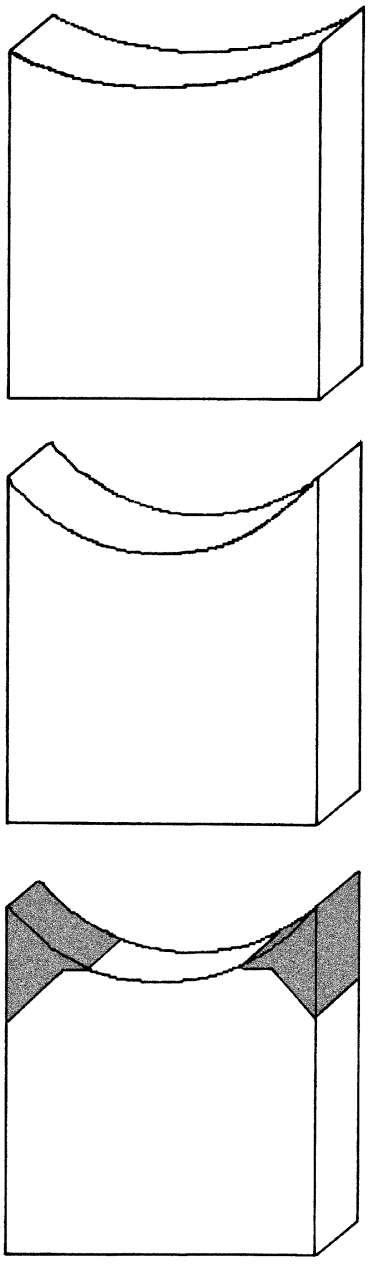

Figure 8.6-1

Carry out the procedure described in paragraph 7.12. “Disassembling the alternator brushes”.

Inspect the 2 brushes for wear, referring to the figures at left and the descriptions below:

- The brush shown in (A) is correctly worn.
- The brush shown in (B) is irregularly worn and may result in noise and wear of the alternator collector.

Using abrasive paper, eliminate the pointed edges as shown in figure (C).

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9. CONFIGURING THE MACHINE

Starting from the release 3.0 of the SW, it is possible to set some configuration parameters of the machine.

Not all CPU boards are compatible with SW release 3.0. Therefore, if after replacing the EPROM with the new one, the machine doesn't start up, it means that in order to upgrade the machine, also the CPU board must be replaced.

9.1. CHANGING THE SETTINGS ON THE DISPLAY PANEL

To change the settings of the machine, when the equipment is in the standby mode, press numeric keys **314** at the same time. The following will appear on the LED matrix:

PASSWORD = 0

Now, use the numeric keys to enter **2406** (the password) and press **ENTER** to confirm. At this point, the setting procedure will show on the LED matrix the actual settings.

9.1.1. LANGUAGE USED

When a language is chosen from the list of languages available, all the messages on the display are automatically shown in the chosen language. To change the current setting, when the language actually in use will scroll on the LED matrix, press the proper numeric key (from **1** to **6**) to choose the desired language, as for the following table:

number key	language
1	ITALIANO
2	USA ENGLISH
3	UK ENGLISH
4	DEUTSCH
5	FRANCAIS
6	NEDERLANDS

and press **ENTER** to confirm your choice.

9.1.2. MEASUREMENT SYSTEM

Either the EUROPEAN (Kg and Km) or the AMERICAN (pounds and miles) measurement system can be chosen. To change the current setting, when the measurement system is actually in use will scroll on the LED matrix, press the proper numeric key (**1** or **2**) to choose the desired measurement system, as for the following table:

number key	measurement system
1	EUR = EUROPEAN
2	USA = AMERICAN

and press **ENTER** to confirm your choice.

9.1.3. MAXIMUM TIME

You can set the maximum time that can be programmed for each exercise. To change the current setting, when the maximum time is actually in use will scroll on the LED matrix, input the desired time using the numeric keys and press **ENTER** to confirm.

9.1.4. ACTIVATING THE "+" AND "-" KEYS

The user can enable the "+" and "–" keys to modify the target heart rate during exercise sessions in CPR mode. To change the current setting, when the setting is actually in use will scroll on the LED matrix, press the proper numeric key (**1** or **2**) to choose the desired setting, as for the following table:

number key	"+" and "–" keys
1	OFF = DISABLED
2	ON = ENABLED

and press **ENTER** to confirm your choice.

9.1.5. DISABLING THE FUNCTION KEYS

The function keys can be disabled so that exercise sessions can be started only using the TGS portable memory. To change the current setting, when the setting is actually in use will scroll on the LED matrix, press the proper numeric key (**1** or **2**) to choose the desired setting, as for the following table:

number key	function keys
1	OFF = DISABLED
2	ON = ENABLED

and press **ENTER** to confirm your choice.

9.1.6. ENABLING THE "ENTER" KEY

The "ENTER" key can be enabled to increase the amount of exercising time during manual and CPR training sessions. To change the current setting, when the setting is actually in use will scroll on the LED matrix, press the proper numeric key (**1** or **2**) to choose the desired setting, as for the following table:

number key	"Enter" keys
1	OFF = DISABLED
2	ON = ENABLED

and press **ENTER** to confirm your choice.

The system will now go back to the standby mode. The "CLEAR" key can be pressed at any time to interrupt the setup procedure and return the equipment to the standby mode.

9.2. MAINTENANCE INFORMATION

In order to perform regular maintenance correctly, the actual number of hours the equipment has been operated and turned on can be visualized by entering a special access code. With the equipment in the standby mode, press numeric keys **314** at the same time. The following message will appear on the matrix display:

PASSWORD = 0

Enter code **1508** (password) and press **ENTER** to confirm. At this point, the LED matrix will scroll the memorized values of the following information.

9.2.1. HOURS ON

The number of hours the machine has been turned on. Press **ENTER** to go ahead.

9.2.2. HOURS OF USE

The number of hours the machine has been operating. Press **ENTER** to go ahead.

The equipment will now return to the standby mode.

9.3. CHANGING THE MAINTENANCE INFORMATION

To set the maintenance information at the desired values (for example after replacing the CPU board), with the equipment in the standby mode, press number keys **314** at the same time. The following message will appear on the matrix display:

PASSWORD = 0

Enter code **2709** (password) and press **ENTER** to confirm. At this point, the LED matrix will show the values you can change.

9.3.1. HOURS ON

To change this value, when the value actually in memory will scroll on the LED matrix, input the desired value using the numeric keys to enter and press **ENTER** to confirm. Just press **ENTER** to maintain the original value.

9.3.2. HOURS OF USE

To change this value, when the value actually in memory will scroll on the LED matrix, input the desired value using the numeric keys to enter and press **ENTER** to confirm. Just press **ENTER** to maintain the original value.

The system will now go back to the standby mode. The “CLEAR” key can be pressed at any time to interrupt the setup procedure and return the equipment to the standby mode.

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10. SCHEDULED MAINTENANCE

To keep the machine in perfect working order, carry out the scheduled maintenance operations specified in the table below:

	CLEANING	TENSION CHECK	WEAR CHECK	PLAY CHECK	LUBRI-CATION
MACHINE EXTERIOR	weekly **(A)**				
MACHINE INTERIOR	monthly **(B)**				
BELT		twice-yearly **(C)**	yearly **(D)**		
CHAIN		twice-yearly **(E)**	yearly **(F)**		twice-yearly **(G)**
SADDLE STEM				twice-yearly **(H)**	

These operations must be carried out with the machine turned off and the mains lead unplugged from the wall output.

The scheduled maintenance operations are described below:

(A) EXTERNAL CLEANING
Carry out every week. For this operation, use only a mild detergent. Be careful never to spray the product directly onto the machine: use it to moisten a cloth.

(B) INTERNAL CLEANING
Carry out every month. Open the side casings (see paragraph 7.7.) and use a vacuum cleaner or compressed air to thoroughly clean the interior, taking special care near the alternator and the electronic circuit boards.

(C) BELT TENSION CHECK
Carry out every 6 months. Open the side casings (see paragraph 7.7.) and check the belt tension. If necessary, adjust the tension as described in paragraph 8.2. .

(D) BELT WEAR CHECK
Carry out once a year. Open the chain (see paragraph 7.7.) and inspect the belt surface over its entire length, paying particular attention to the edges and the inner part. If it appears worn out or frayed, replace the belt (see paragraph 7.10.).

(E) CHAIN TENSION CHECK
Carry out every 6 months. Open the chain (see paragraph 7.7.) and check the belt tension as described in paragraph 8.4. .

(F) CHAIN WEAR CHECK

Carry out once a year. Open the side casings (see paragraph 7.7.) and check for links that are jammed and/or have excessive play.

(G) CHAIN LUBRICATION

Carry out every 6 months. Open the side casings (see paragraph 7.7.) and lubricate the chain using spray grease (cod. 0V021): spray the grease while simultaneously turning the pedal crank.

(H) CHECK PLAY ON SADDLE STEM

Carry out every 6 months. Open the side casings (see paragraph 7.7.) and check the play on the saddle stem by moving the saddle in the four directions. If the amount of play is excessive, adjust it as described in paragraph 8.5. .

11. APPENDIX

11.1. TECHNICAL NOTES ON CARDIO RECEIVERS

The receiver shown in the figure below is equipped with:

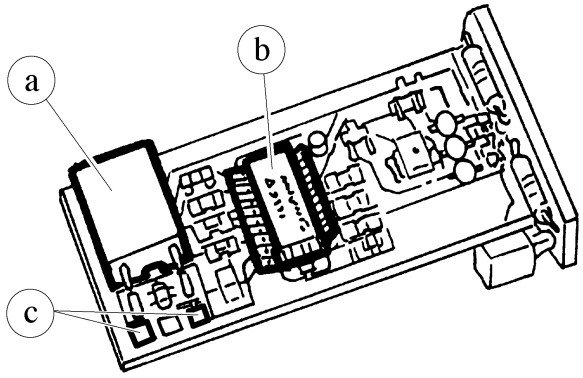


Figure 11.1-1

- an antenna **a**, designated the “coil”, which receives the signal from the transmitter strap worn by the user.
- an integrated circuit **b**, designated the ASIC, which has the function of filtering the analog signal and generating a pulse train corresponding to the received heart rate.
- two contacts **c** parallel to the coil, on which a 15 KOhm resistor is sometimes mounted.

The following paragraphs contain various suggestions regarding the cardio receivers, which may be useful for improving the reception of the cardio signal.

11.1.1. TYPE OF ASIC

The cardio receivers can be equipped with 3 different types of ASIC, identifiable by the code marked on the component: MAS, FTC or HRRE. These ASICs are characterized by different reception ranges and different levels of immunity to noise. Tests have determined that the maximum reception distances are as follows:

ASIC	DISTANCE (cm)
MAS	90
FTC	100
HRRE	85

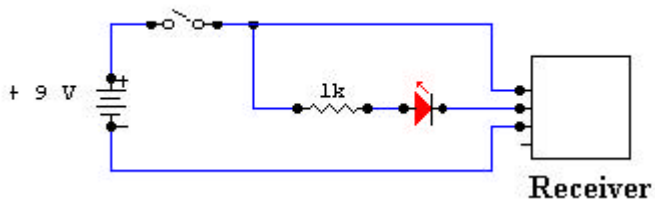
As regards sensitivity to noise, the best ASIC is the HRRE model. This ASIC is also the one recommended by the manufacturer.

11.1.2. PRESENCE OF ELECTROMAGNETIC FIELDS

The receiver is sensitive to electromagnetic fields produced by the switching of LEDs, motor brushes, the commutation of power devices, monitors, neon lights, stereo equipment, etc., which can impair its operation. It has been found that such electromagnetic fields directly affect the analog part of the receiver (detected by the coil) whereas they have no effect on digital components such as the CPU receiver connecting cable.

Electromagnetic interference can take two different forms: on the one hand, the receiver may detect and hence generate spurious transients, or on the other hand the receiver may become saturated. The presence of transients is generally accompanied by irregular blinking of the heart rate LED on the display, but does not affect the value shown which is processed by special SW filters. Saturation of the receiver, on the other hand, is a phenomenon which, depending on its intensity, can reduce the maximum reception distance until it becomes completely impossible to receive a signal.

In the presence of electromagnetic interference, use the frequency signal monitor shown in the schematic below to determine the presence, intensity and effect of the fields.



This circuit causes the LED to light for every heart beat and/or transient detected: in this way it is possible to determine whether there is electromagnetic noise, and identify its source.

The only effective solution in the presence of electromagnetic interference is to reduce the power of the noise source, using a trial and error method based principally on:

- Shielding the noise source.
- Increasing the distance between the noise source and the receiver, if necessary by changing the position of the machines.

It is also possible to reduce the receiver's ability to detect interference by:

- Changing the position of the receiver;
- Reducing the sensitivity of the receiver (see paragraph 11.1.3.) In some cases, it was found to be effective to screen the receiver inside a tagger box having a thickness of 0.15 mm.

Please note that these are merely some possible suggestions, and that the effectiveness of the chosen solution must be verified in practice.

11.1.3. REDUCING RECEIVER SENSITIVITY

It is possible to diminish the receiver's sensitivity in order to reduce its range of reception. This solution is recommended in the following cases:

- presence of electromagnetic fields which interfere with reception or saturate the receiver;
- problems due to interaction between the receiver on one machine and the signal transmitted by a user training on another machine that is too close and cannot be moved farther away.

Sensitivity is reduced by soldering a resistor in parallel with the coil. Normally, the receiver already has a 15 KOhm resistor mounted in series with the coil, however it is advisable to check for its presence.

The following table shows the nominal values of reception distance based on the value of the resistor soldered on the coil:

RESISTANCE (Ohm)	DISTANCE (cm)
15K	89
13K	88
11K	87
9K1	85
6K8	84
5K1	81
3K	74
2K	69
1K	57

Please note that these are only nominal values. The actual reduction in sensitivity must be verified experimentally, taking great care not to excessively reduce the reception distance.

☞ **OBSERVE: if there is already a 15 KOhm resistor mounted in parallel with the coil, note that adding another resistor in parallel will result in a total resistance value equivalent to the parallel combination of the added resistor and the existing 15 KOhm resistor.**

11.1.4. MECHANICAL VIBRATIONS

Mechanical vibrations may cause slight shifting of the coil, giving rise to transient pulses. If these transients occur only occasionally they can be easily filtered by SW. However, if the mechanical vibrations are periodic, they can produce periodic pulses which may be interpreted as correct heart rate values.

To eliminate or reduce the effects of vibration, house the receiver between the foam pads in such a way that any vibrations are correctly damped.

☞ **OBSERVE: when securing the foam pads and the receiver with a strap, be careful not to overtighten the strap as this may reduce the damping capacity of the foam pad.**

11.1.5. POSITION OF THE RECEIVER

Carefully position the receiver according to the specifications below:

- the coil must be directed toward the user;
- the coil must be positioned well away (even a few centimeters) from the LEDs;
- the cable must be folded immediately after the connection on the receiver, in order not to pass near the coil;
- the receiver must be directed in such a way that its axis of reception, shown in the figure below, is parallel to that of the transmitter, shown in the figure below too:

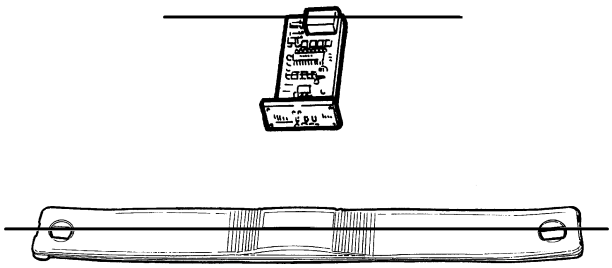


Figure 11.1-2

Please note that even a slight deviations from the above specifications may considerably impair the accuracy of reception.

The optimal situation is therefore that shown in the figure below:

- Receiver situated below the display.

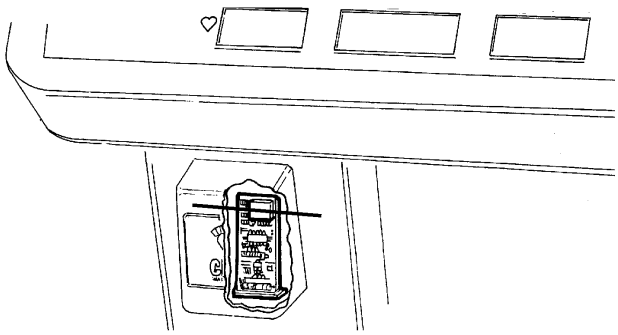


Figure 11.1-3

- Receiver housed in a box inside the display.

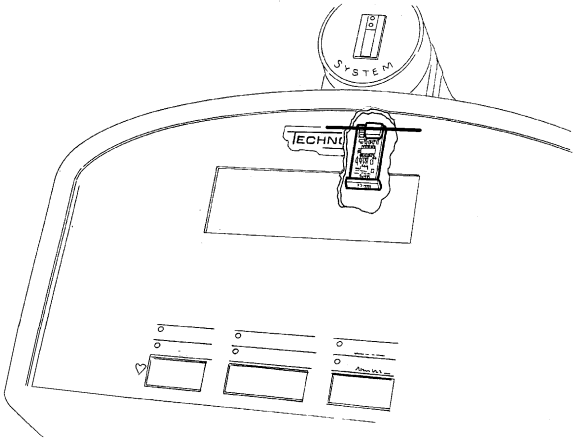


Figure 11.1-4

11.1.6. ROUTING OF CABLES

The cables must be routed with great care in order prevent them from interfering with the receiver coil. Therefore, particularly in cases where the receiver is housed inside the display, it is recommended to:

- Route cable **a** behind the studs which fix the display on its support, and not on top of the CPU board;
- The TGS cable, if present, must be routed behind connector CN1 on the CPU board to ensure that it does not go near the receiver coil when the display is closed.

The figure below illustrates the optimal routing described above.

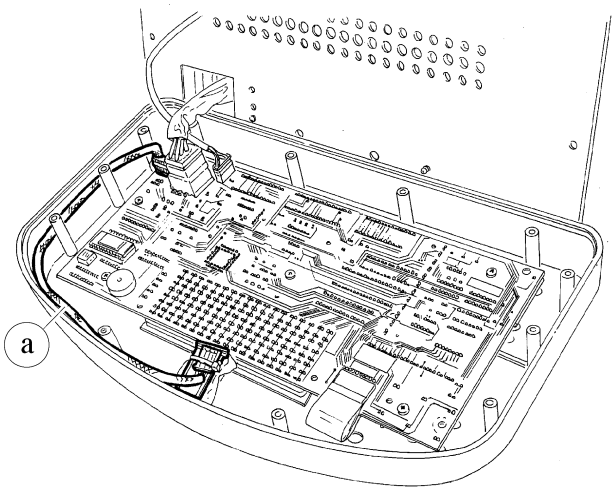


Figure 11.1-5

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