Run 600 XTPRO

SERVICE & MAINTENANCE MANUAL

REV. 1.3

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 or use of this manual.

Contents

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 drawings which illustrate the procedure being described.

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

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 Newsletters, 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	77 cm
Length	212 cm
Height	140 cm
Weight	220 Kg

2.2. ELECTRICAL CHARACTERISTICS

There are two separate models of the machine for 220 and 110 VAC mains electricity supplies, which differ in certain components detailed in paragraph 2.7. :

	110 Model	**220 and 220 USA Models**
Mains voltage	115 VAC	230 VAC
Frequency	50 - 60 Hz	50 - 60 Hz
Consumption	~ 1800 Watt - 16 A	~ 1800 Watt - 8 A
Fuse	5x20 4 A fast-blow	5x20 4 A fast-blow

2.3. AMBIENT SPECIFICATIONS

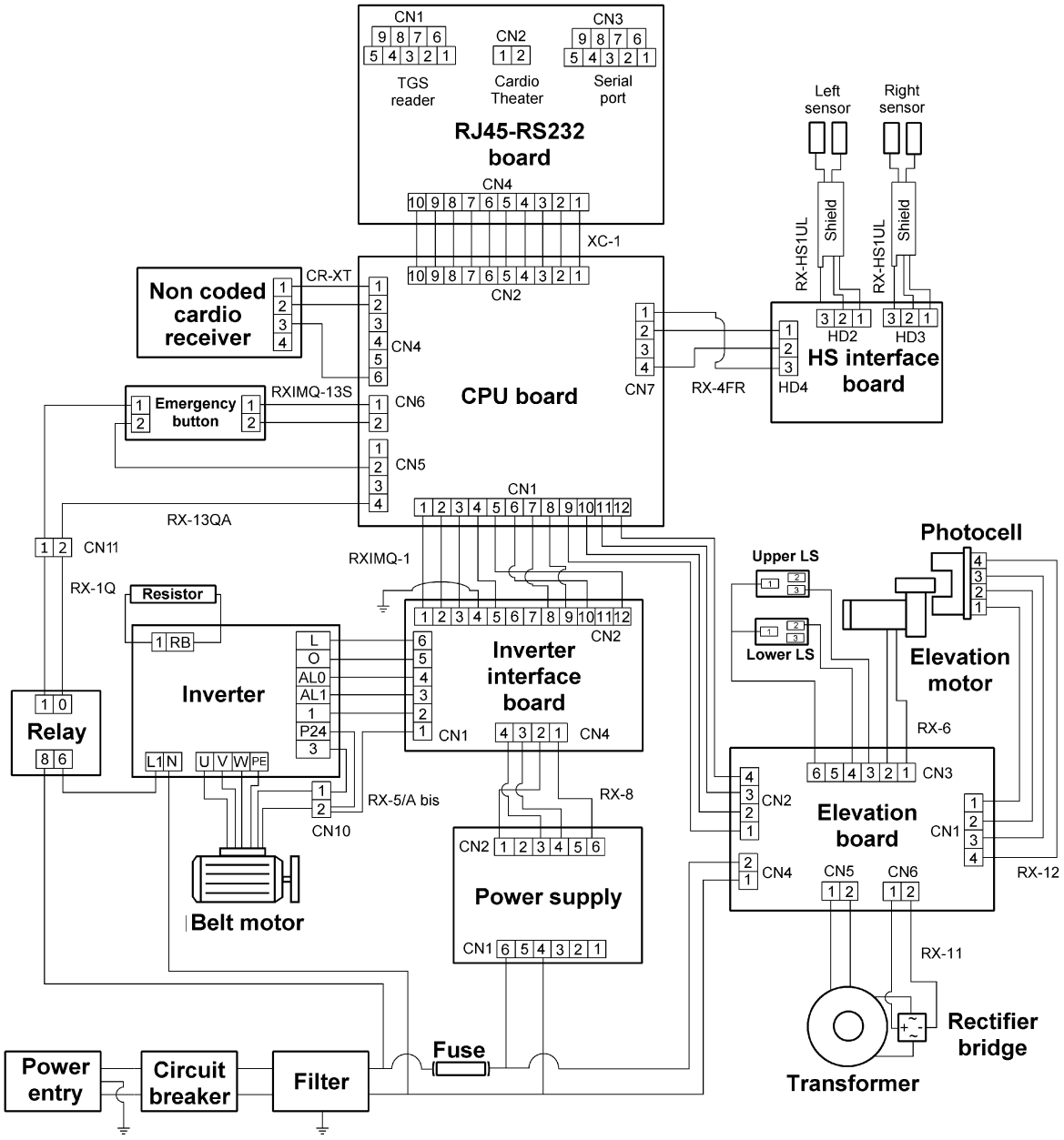
Temperature	Operating	from 5° to 35° C
	Storage	from -20 to 55° C
Humidity	Operating	from 30% to 80% non-condensing
	Storage	from 5% to 85% non-condensing

2.4. CONFORMITY TO REGULATIONS

The machine conforms to the following directives:

	Europe	**USA**
EMI	EN 60601-1-2	UL 2601-1
Safety	EN 60601-1 EN 957-1	
Directive	73/23/CEE 93/68/CEE 89/336/CEE	

2.5. WIRING DIAGRAM FOR THE 220 MODEL WITH NON-CODED RECEIVER



2.5.1. CONNECTORS

- CPU board

Name	type of connector	connection
CN1	AMP MATE-N-LOCK 12 -pin F.	to inverter interface board
CN2	Flat 10-pin	to RJ45-RS232 board
CN4	AMP MODU II 6-pin M.	to cardio receiver
CN5	AMP MODU II 4-pin M.	to emergency button
CN6	AMP MODU II 2-pin M.	to emergency button
CN7	AMP MODU II 4-pin M.	to HS interface board

- RJ45-RS232 board

Name	type of connector	connection
CN1	Male panel connector DB9	to TGS reader
CN2	Panel RJ45	to Cardio Theater
CN3	Female panel connector DB9	to external device (not used)
CN4	Flat 10-pin	to CPU board

- HS interface board

Name	type of connector	connection
HD2	Molex 3-pin	to left hand sensor
HD3	Molex 3-pin	to right hand sensor
HD4	Molex 3-pin	to CPU board

- Power supply

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

- Inverter interface board

Name	type of connector	connection
CN1	AMP MATE-N-LOCK 6-pin F.	to inverter
CN2	AMP MATE-N-LOCK 12-pin F.	to CPU board
CN4	AMP MOD I 4-pin M	to power supply

- Elevation board

Name	type of connector	connection
CN1	AMP MOD II 4-pin M.	to photocell
CN2	AMP MATE-N-LOCK 4-pin F.	to CPU board
CN3	AMP MATE-N-LOCK 6-pin F.	to elevation motor – limit switches
CN4	AMP MATE-N-LOCK 2-pin F.	to mains electricity supply
CN5	Sauro 2-pin	to transformer
CN6	Sauro 2-pin	to rectifier bridge

- Patch cord

Name	type of connector	connection
CN10	Faston	between belt motor and inverter interface board
CN11	Faston	between relay and CPU board/emergency button

2.5.2. WIRING

The high voltage power supply cables and the ground connections are not described here, in that they can be easily determined from the wiring diagram above.

RXIMQ-1: Internal connection cable CPU board – Inverter interface board – Elevation board				
CPU board CN1	**Signal**	**Color**	**Inverter interface board CN2**	**Elevation board CN2**
1	+12 Vdc	Blue 1	1	-
2	+5 Vdc	Brown 1	2	-
3	Ground	Gray 1	3	-
4	-12 Vdc	White	5	-
5	not used	Violet	12	-
6	Tread belt speed reference (PWM)	Red	10	-
7	Start	Black	8	-
8	Inverter alarm	Orange	9	-
9	Status	Brown 2	-	1
10	Up	Pink	-	2
11	Down	Blue 2	-	3
12	Ground	Gray 2	-	4

RX-5/A bis: Inverter cable Inverter interface board – Inverter – Patch cord				
Inverter interface board CN1	**Signal**	**Color**	**Inverter**	**Patch cord CN10**
-	Thermal cutout	Green	3	2
1	Thermal cutout Gnd	White	-	1
-		White	P24	
2	Start	Grey	1	-
3	Alarm	Blue	AL1	-
4	Alarm Gnd	Red	AL0	-
5	Speed analogue reference (0-10 Vdc)	Brown	O	-
6	Speed Gnd	Black	L	-

RX-6: Elevation motor cable Elevation board – Elevation motor – Limit Switches					
Elevation board CN3	**Signal**	**Color**	**Elevation motor**	**Upper LS**	**Lower LS**
1	Motor power supply	Brown	1	-	-
2	Motor ground	Blue	2	-	-
3	NO upper limit	White	-	3	-
4	NC lower limit switch	Violet	-	-	2
6	Limit switch ground	Black	-	1	1

RX-8: Low voltage power supply cable Power supply – Inverter interface board			
Power supply CN2	**Signal**	**Color**	**Inverter interface board CN4**
1	+12 Vdc	Red	2
3	+5 Vdc	Yellow	4
4	Ground	Black	3
6	-12 Vdc	Blue	1

RX-11: Elevation motor power supply cable Elevation board – Rectifier bridge			
Elevation board CN6	**Signal**	**Color**	**Rectifier bridge**
1	48 VAC	Red	+
2	Ground	Black	–

RX-12: Photocell cable Elevation board – Photocell			
Elevation board CN1	**Signal**	**Color**	**Photocell**
1	+5 Vdc	Red	1
2	Clock	Orange	2
3	Direction	Blue	3
4	Ground	Black	4

RX-13S: Emergency button cable CPU board – Emergency button			
CPU board CN6	**Signal**	**Color**	**Emergency button**
1	NC contact	Black	2
2	Reference	Clear	1

RX-13QA: Emergency button cable Emergency button - CPU board – Patch cord				
Emergency button	**Signal**	**Color**	**CPU board CN5**	**Patch cord CN11**
1	Reference	Brown	-	1
2	Relay power supply (-12 Vdc)	Brown	2	-
-		Blue	4	0

RX-1Q: Relay cable Patch cord – Relay			
Patch cord CN11	**Signal**	**Color**	**Relay**
1	Relay power supply (12 Vdc)	Blue	1
2	Reference	Brown	0

The connection to pins “0” and “1” can be swapped.

XC-1: Output ports cable CPU board – RJ45-RS232 board			
CPU board CN2	**Signal**	**Color**	**RJ45-RS232 board CN4**
1	+12 Vdc	flat	1
2	+12 Vdc	flat	2
3	Tx to TGS	flat	3
4	+5 Vdc	flat	4
5	Rx from TGS	flat	5
6	Tx to PC	flat	6
7	Ground	flat	7
8	Rx from PC	flat	8
9	Ground	flat	9
10	Ground	flat	10

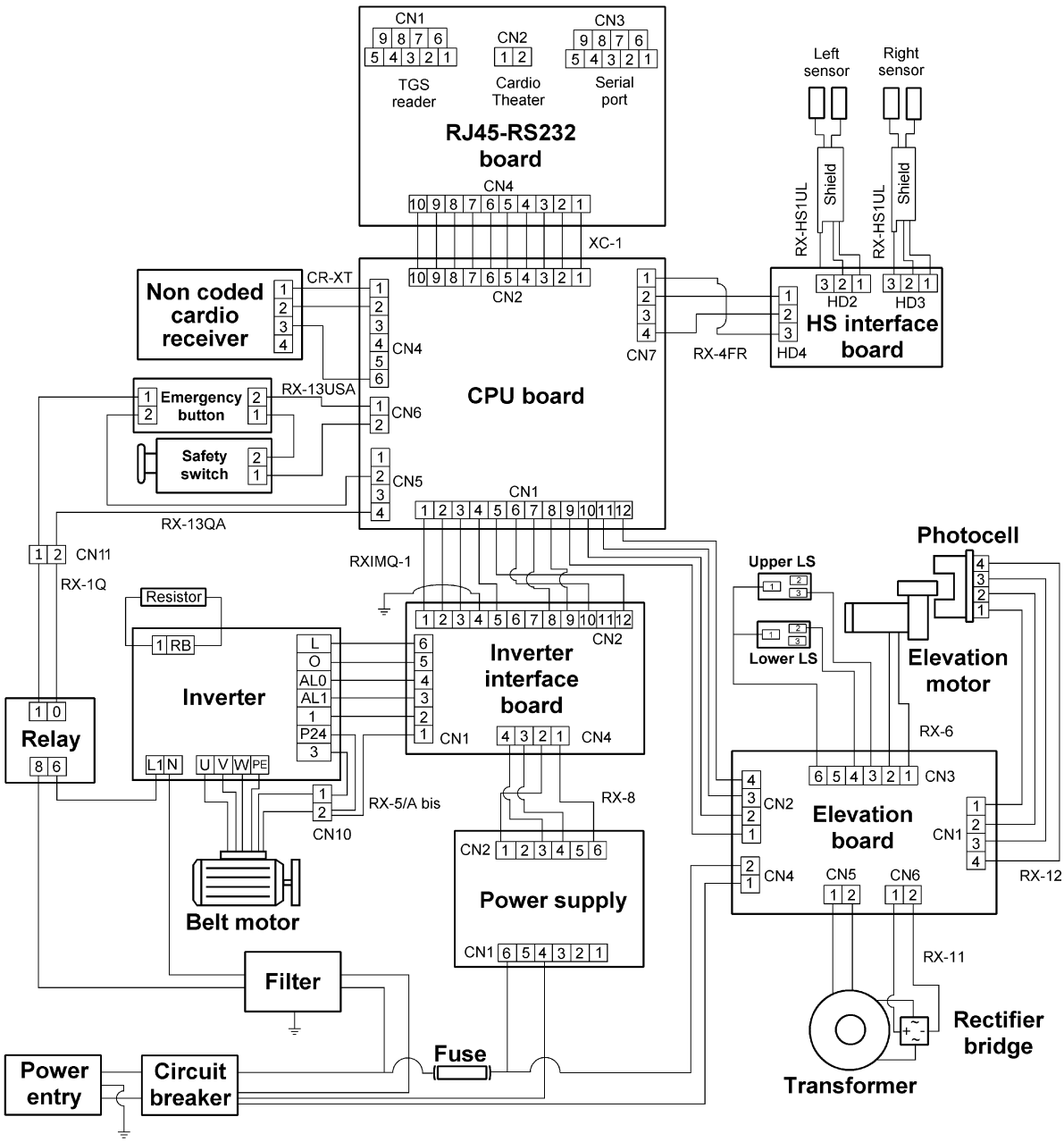
CR-XT: Non coded heart rate meter cable CPU board – Cardio receiver			
CPU board CN4	**Signal**	**Color**	**Receiver**
1	+5 Vdc	Red	1
2	Pulse per beat	Blue	2
6	Ground	Black	3

RX-4FR: Hand sensor cable CPU board – HS interface board			
CPU board CN7	**Signal**	**Color**	**HS interface board HD4**
1	Pulse per beat	Blue	3
2	Ground	Black	1
4	+5 Vdc	Red	2

RX-HS1UL: Sensor cable HS interface board – Sensor			
HS interface board HD2-HD3	**Signal**	**Color**	**Sensor**
1	Signal	Black	Faston
2	Signal reference	Clear	Faston
3	Shield	Black	-

2.6. WIRING DIAGRAM FOR THE 220 USA MODEL

The differences in the 220 USA model are the high voltage power supply section and the presence of an additional emergency device called a “Safety Switch”:



The differences compared to the 220 standard model are:

- power supply cable;
- high voltage wiring;
- use of a filter only for the inverter;
- presence of an additional emergency device called a “Safety Switch” in series with the standard emergency button. This device consists of a reed relay and a magnet, connected to a cable which clips onto the user running on the machine. If the user moves away from the display, the cable is

pulled taut and eventually detaches the magnet when the distance becomes excessive. The absence of the magnet causes the reed relay to commutate from closed to open, generating the emergency signal. The safety switch requires cable RXIMQ-13S to be modified as follows:

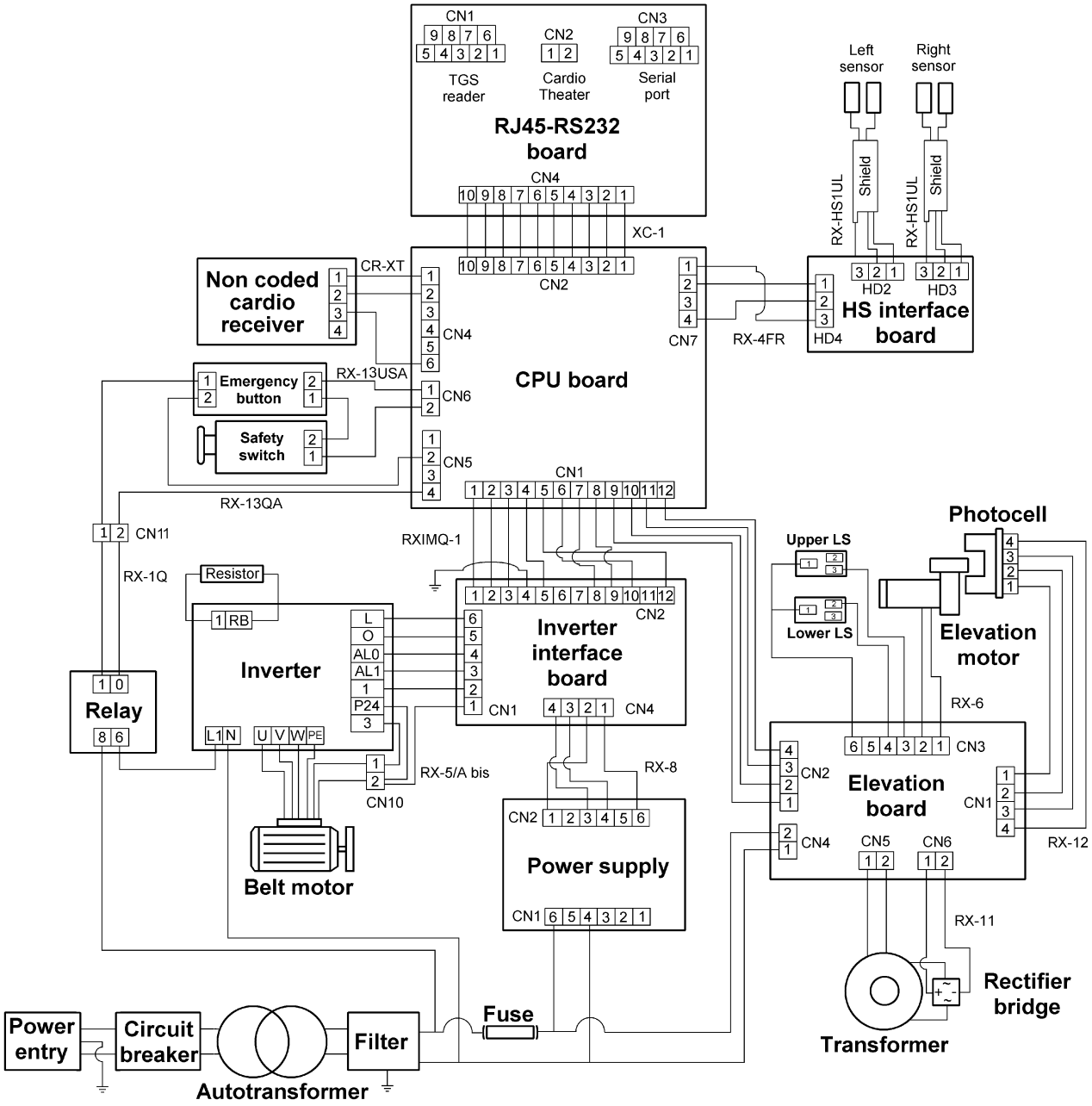
RX-13USA: Emergency cable CPU – Emergency button – Safety switch				
CPU board CN6	**Signal**	**Color**	**Emergency button**	**Safety switch**
1	NC contact	Black	2	-
-	NC contact	Yellow	1	2
2	Reference	Orange	-	1

An upgrade kit is available (code 0WK247) for installing the safety switch on European machines.

The other cables are unchanged. Therefore, for their description, refer to the details provided for the 220 Model.

2.7. WIRING DIAGRAM FOR THE 110 USA MODEL

The 110 VAC mains supply is handled by an autotransformer connected to the output of the automatic circuit breaker, which receives the 110 VAC input and generates the 220 VAC output. From this point onward the machine wiring diagram is the same as for the 220 version:

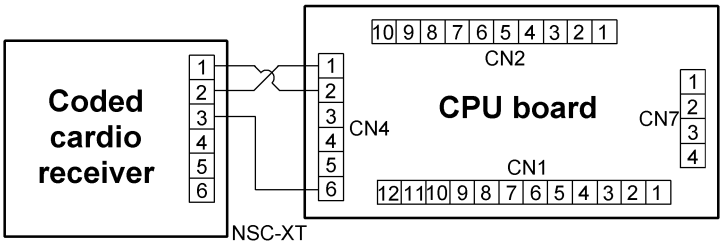


The differences compared to the 220 USA model are:

- the automatic circuit breaker is 20 A - class D instead of 10 A - class C;
- autotransformer 110 - 220;
- mains lead with different cable section and plug;
- 16 A filter instead of a 20 A;
- safety switch as in 220 USA model.

2.8. WIRING DIAGRAM WITH CODED RECEIVER

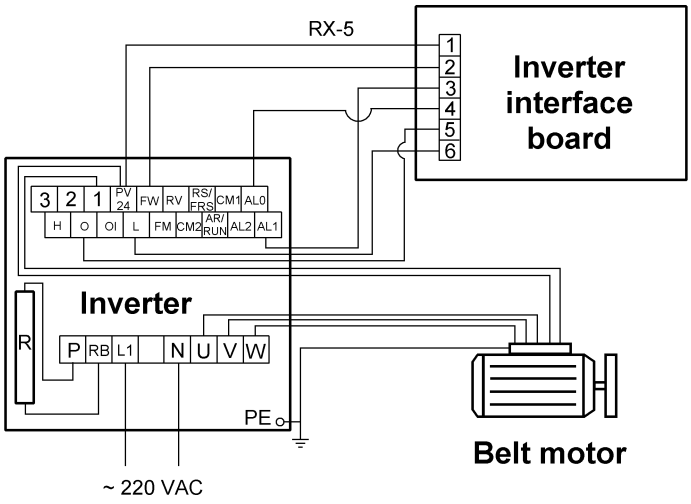
The only difference compared to the model with non-coded receiver is the NSC-XT cable between the CPU board and the coded receiver, which is described below:



NSC-XT: Non coded heart rate meter cable CPU board – Cardio receiver			
CPU board CN4	**Signal**	**Color**	**Receiver**
1	+5 Vdc	Red	2
2	Pulse per beat	Blue	1
6	Ground	Black	3

2.9. WIRING DIAGRAM WITH HITACHI J100 INVERTER

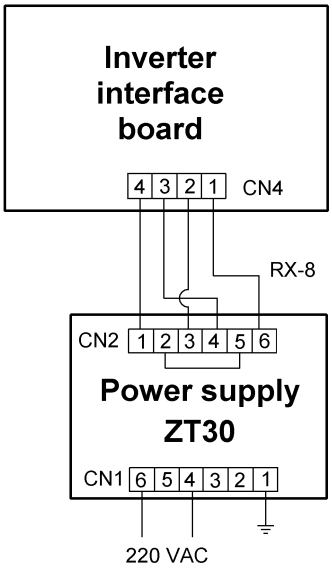
The difference with respect to the model with Hitachi SJ100 inverter lies in the inverter itself, and its connection to the motor and to the inverter interface board as illustrated below:



RX-5: Inverter cable Inverter interface board – Inverter – Motor thermal cutout				
Inverter interface board CN1	**Signal**	**Color**	**Inverter**	**Motor thermal cutout**
1	Reference	White	PV24	-
-	Thermal cutout reference	Red		1
-	NC thermal cutout	Red	1	2
2	Start	Gray	FW	-
3	NC Alarm	Violet	AL1	-
4	Alarm reference	Red	AL0	-
5	Inverter control (0-10 Vdc)	Brown	O	-
6	Inverter control reference	Black	L	-

2.10. WIRING DIAGRAM WITH ZT30 POWER SUPPLY

The difference with respect to the model with SWT40 power supply lies in the power supply itself, and its connection to the inverter interface board as illustrated below:



RX-8: Low voltage power supply cable Power supply – Inverter interface board			
Power supply CN2	**Signal**	**Color**	**Inverter interface board CN4**
1	+12 Vdc	Red	4
2-4-5	Ground	Black	3
3	+5 Vdc	Yellow	2
6	-12 Vdc	Blue	1

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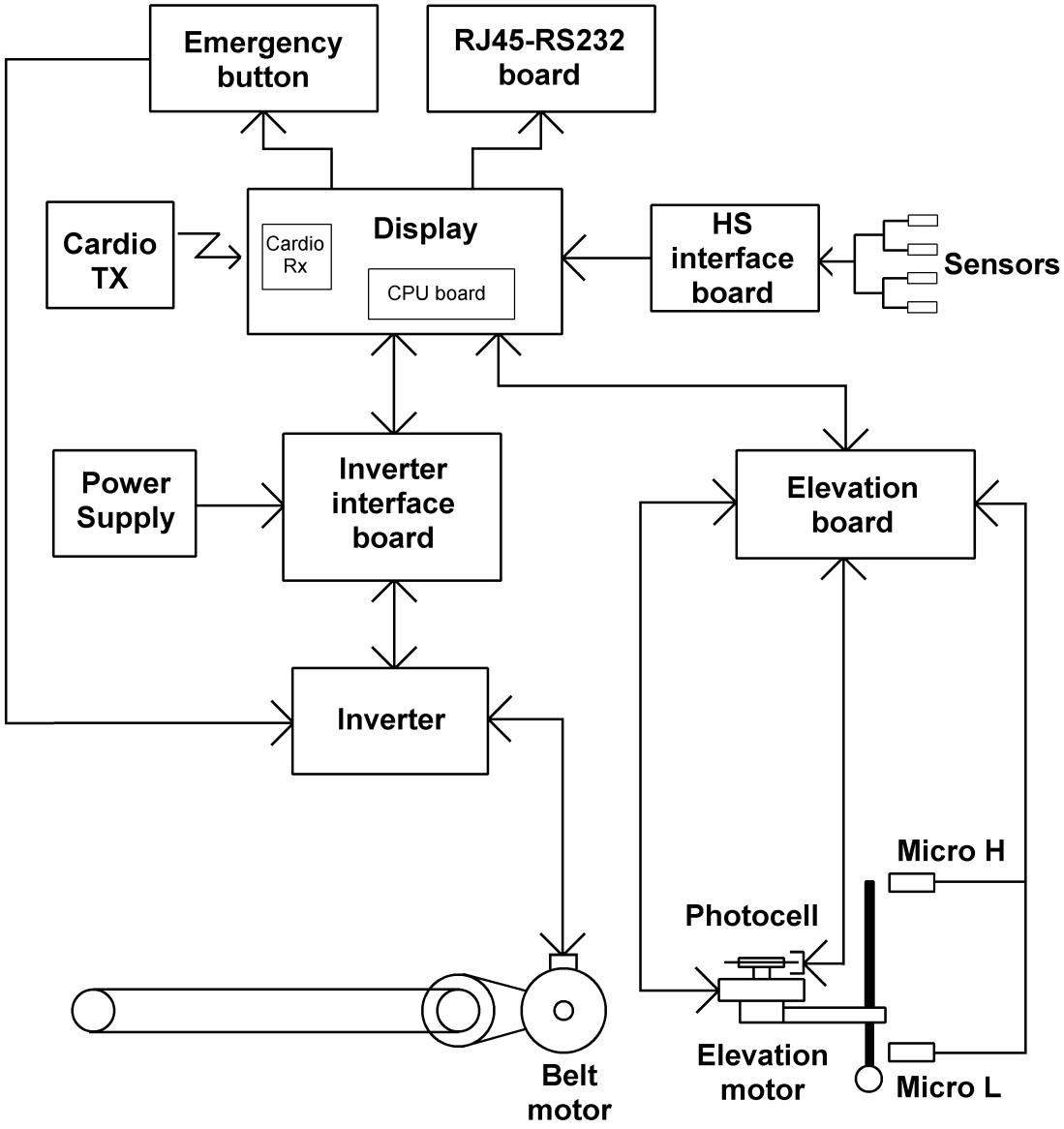
3. PRINCIPLES OF OPERATION

3.1. BLOCK DIAGRAM

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



3.1.1. DISPLAY

It consists of various components that will be individually described below:

CARDIO RECEIVER

It is connected to the machine's CPU board and receives the pulses sent by the transmitter. There are 2 types of receiver:

- **Non-coded**: this is the standard product.
- **Coded**: this is the product which, utilizing Personal Coded Device technology, receives the heart rate together with a code that identifies the transmitter in question. In this way the machine can identify the source of the heart rate signal, thereby avoiding interference problems.

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 it is non-coded and there are 2 transmitters within its area of reception, it will receive signals from both, and may produce an error or irregular reading.

CPU BOARD

This is the heart of the machine, which controls all the machine functions by executing 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 and/or the HS interface board (user's heart rate), from the inverter interface board and from the elevation interface board. It controls the speed selected with the "+" "–" keys and the elevation selected with the "↑" "↓" keys or according to the chosen training program. It receives the error signal from the inverter interface board and the status signal from the elevation interface board.

3.1.2. EMERGENCY BUTTON

This is the user safety device. Starting from the machine with SN 02000549, it consists of a new maintained button which needs to be released after it has been pressed.

The button, which has a NC contact, is connected both to the CPU board and to a relay which enables the inverter power supply. Once the button has been pressed, the relay shuts off the power supply to the inverter and the motor stops. At the same time, the CPU board also detects that the button was pressed, interrupts the exercise and shows a message on the display. To resume using the machine, it is necessary to wait at least 5-10 seconds before returning the emergency button to the working position. In the USA version of the machine, the button is connected in series with a reed contact which is NC when the "Safety switch", a plastic button containing a magnet, is resting in its normal position on the display.

3.1.3. 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. There are 2 types of transmitter:

- **Non-coded**: this is the standard product;
- **Coded**: this is the product which, utilizing Personal Coded Device technology, transmits the heart rate together with a code that identifies the transmitter in question. In this way, the coded receiver on the machine can identify the source of the heart rate signal, thereby avoiding interference problems.

3.1.4. HS INTERFACE BOARD

This circuit board manages the hand sensors, interfacing them to the CPU board. It processes the analog signal received from the sensors and outputs one pulse for every heart beat detected, with positive logic: the signal is normally at 0 Vdc, and is asserted to 5 Vdc (with a pulse whose

amplitude of approximately 30 msec) each time a heart beat is detected.

There are 3 jumpers on this circuit board, which must be configured as indicated in the table below:

Jumper	Configuration
JP1	Open
JP2	Closed
JP3	Closed

3.1.5. RJ45-RS232 BOARD

This circuit board provides the machine connections to external devices:

- 1 serial port for connecting to the TGS reader;
- 1 serial port, currently not used, for future connections;
- 1 RJ45 port for the power supply to the portable Cardio Theater unit.

3.1.6. POWER SUPPLY

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

3.1.7. BELT MOTOR

An asynchronous three-phase motor which, by means of a pulley and a poly-v belt, turns the driving roller of the tread belt. Each motor phase is equipped with a normally-closed bimetallic safety which opens when the temperature exceeds a preset threshold, in order to safeguard the integrity of the motor. The 3 bimetallic safeties are connected in series and reach the inverter as a NC external input signal. When this contact opens, the inverter generates an alarm.

When the new emergency button has been introduced, the flywheel has been modified too. It is bigger in order to have a smoother slow down when the emergency button has been pressed or when the power supply goes off.

The belt motor has a power of 1.5 KW (2 Hp).

3.1.8. INVERTER

This is the device which supplies the three-phase belt motor. It receives a DC reference voltage from the inverter interface board. Variations in this voltage cause corresponding variations in the VAC frequency produced by the inverter, in the rotation speed of the motor, and hence change the speed of the tread belt. It handles motor drive errors and, in the event of an error, shuts down the power supply to the motor and sends an alarm signal through the interface board to the display. The event which caused the error is memorized as an error code.

The inverter power supply is enabled by the relay activated by the emergency button. When the button is pressed, the relay contact opens, the power to the inverter goes off and hence the belt motor stops.

The following inverter models are used on these machines:

- **Hitachi J100**: installed up until serial number 01000078;
- **Hitachi SJ100**: on actual production.

The inverter has a power of 1.5 KW (2 Hp).

3.1.9. INVERTER INTERFACE BOARD

Receives from the display an enable signal for the inverter and a PWM signal proportional to the selected speed, and converts it into a continuous voltage for controlling the inverter. Receives the error signal generated by the inverter in the event of problems and transmits it to the display. Receives the low voltages output by the power supply and passes them to the display. There are 2 LEDs on the board:

- **DL1**: illuminates when the tread belt is moving;
- **DL2**: illuminates when the inverter does not detect any error conditions and therefore the alarm signal is inactive.

3.1.10. ELEVATION MOTOR

It is a DC motor which, by means of a mechanical reduction unit and a timing belt, turns the lead screw nuts on the threaded elevation bars, causing the machine to be raised or lowered depending on the direction of rotation.

3.1.11. PHOTOCELL

This is the device which provides feedback on the motion of the elevation motor. It transmits one pulse for each tooth detected on the encoder wheel which is fixed to the gearmotor, and a signal indicating the direction of movement.

The photocell used on these machines is the **Optek OPB610** photocell mounted on circuit board **GF970711**.

3.1.12. ELEVATION BOARD

Receives from the display the enable signal for elevation motion and converts it into a control for the elevation motor. Generates its power supply and the DC power supply for the motor by means of a transformer and rectifier bridge. Determines the motor position, and hence the treadmill elevation, by means of the photocell. Generates and sends to the display a motion status signal at every 0.5% variation in the elevation.

The SW version of the chip mounted on the board to be used is **RX50V1** and is identified by the label on the chip.

It checks the lower and upper travel limits by means of 2 limit switches. The board includes 2 LEDs associated to the limit switches, which are normally illuminated:

- **DL1**: comes off when the upper limit switch is tripped;
- **DL2**: comes off if the lower limit switch is tripped.

3.1.13. MICROSWITCH

There are 2 limit switches which control the range of motion of the elevation mechanism. These switches are positioned at the travel limits of the elevation bars, and change state when pressed and/or released. The lower limit switch is NC, while the upper one is NO.

3.2. TREAD-BELT MOTOR DRIVE

3.2.1. MECHANICS

The tread belt is actuated by the motor through a linkage consisting of the motor pulley, the driving roller and the belt which connects them. In this way, a given belt motor speed corresponds to a predetermined linear tread belt speed. The belt motor is controlled by the inverter which generates a variable-frequency sine wave signal: variations in frequency cause the motor speed and hence the tread belt speed to vary.

3.2.2. CONTROLS

To start the motor, the CPU board sends the inverter a Start signal through the inverter interface board, enabling the inverter to drive the motor. After outputting this enable signal, the CPU board sets the motor speed by sending a PWM signal to the inverter interface board, which the inverter interface board converts into an analog input voltage to the inverter. The relationship between the analog input voltage and the inverter output frequency is determined by the values of the configuration parameters in the inverter program.

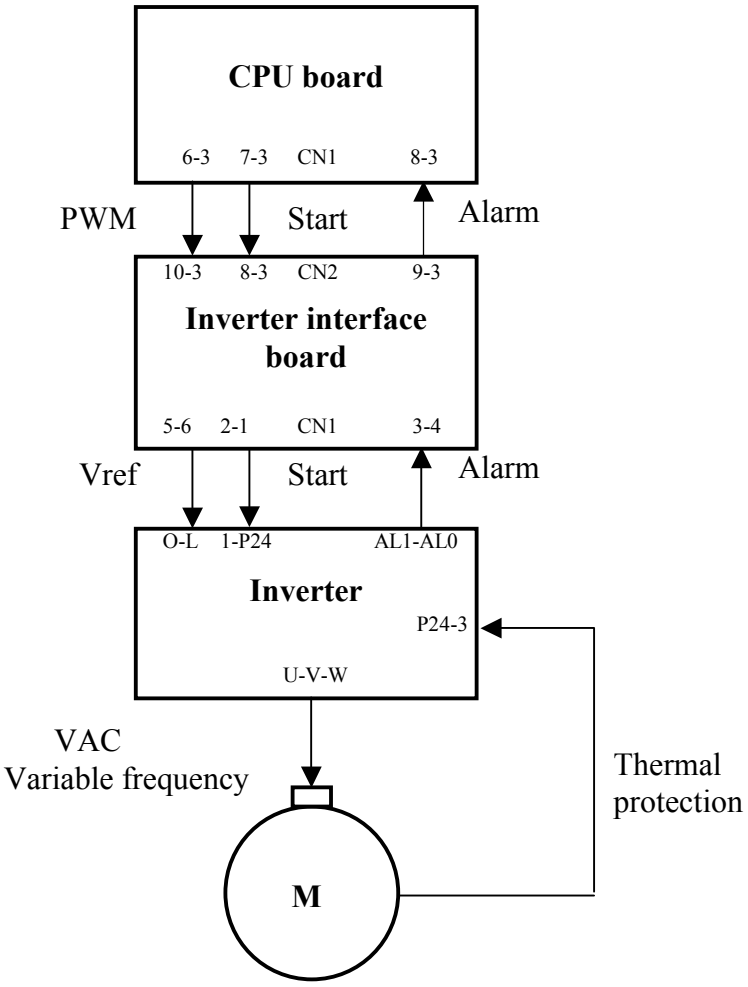
During its movement, the inverter checks the motor and, if any problems are detected (overvoltage, overcurrent, SW and HW problems to the inverter, etc.) it halts the motor and sends an alarm signal to the CPU board, which displays the error message

- CAUTION = E3 if the alarm signal is sent at the belt start;
- CAUTION = E4 if the alarm signal is sent during the belt movement.

To protect the motor from overheating, each motor phase has a thermal cutout connected in series. If the temperature exceeds the threshold value, the thermal cutout opens and interrupts the circuit. The inverter detects this condition as the opening of a NC external contact. In such a case the inverter halts the motor and outputs an alarm signal to the CPU board, which displays the error message cited above.

3.2.3. THE SIGNALS INVOLVED

The machine controls the speed of the belt motor by means of the CPU board and the inverter interface board, as shown in the following figure:



The speed control utilizes the following signals:

- **Start signal**
  This is the signal generated by the CPU (pin 7-3 of connector CN1) to enable starting of the motor. When the tread belt is stopped this signal is at logic level low (0 Vdc), whereas immediately after the "Start" button on the display is pressed it goes high (4.8 Vdc).
  The signal enters the inverter interface board (pin 8-3 of connector CN2), is processed and sent out (pin 2-1 of connector CN1) to the inverter. In the belt-stopped condition it is -25.3 Vdc, while immediately after pressing the "Start" button on the display it is -2.7 Vdc.

- **Speed reference signal**
  This is the signal generated by the CPU (pins 6-3 of connector CN1) to control the motor speed. It is a PWM signal, that is to say a fixed frequency square wave with a variable duty cycle. The logic of this control has the duty cycle decreasing with increasing speed. The measurement of its DC component with a multimeter shows a value that decreases with increasing speed, from a maximum of approximately 5 Vdc down to a few hundred mVdc.
  This signal enters the inverter interface board (pins 10-3 of connector CN2), is converted into a variable analogue signal between 0 and 10 Vdc and sent out (pins 5-6 of connector CN1) to the inverter. The signal input to the inverter increases with increasing speed.

The relationship between the speed reference and the inverter frequency is determined by the programming of the inverter.

- **Variable frequency VAC signal**
  This is the variable frequency alternating voltage generated by the inverter (pin U-V-W) for supplying the motor. The motor speed increases with increasing frequency.

- **Thermal cutout signal**
  Each motor phase is equipped with a normally-closed thermal cutout which opens when the temperature exceeds a preset threshold. The 3 thermal cutouts are connected in series and exit the motor via a 2-wire cable connected to the inverter (P24-3). The inverter is programmed to expect a NC signal on these pins. When at least one thermal cutout is triggered, the contact opens and the inverter, detecting the open-circuit condition, generates an alarm signal.

- **Alarm signal**
  This is the signal generated by the inverter if a problem is detected in the motor drive, or if the motor thermal cutouts open. It enters the inverter interface board (pins 3-4 of connector CN1) and its value is 0 Vdc under normal conditions, 10 Vdc under alarm conditions.
  The signal is then sent from the inverter interface board (pins 9-3 of connector CN2) to the CPU board (pins 8-3 of connector CN1) and is 5 Vdc under normal conditions, 0 Vdc under alarm conditions. When this alarm signal switches to 0 Vdc, the CPU disables the Start signal, resets the PWM signal and shows the “CAUTION = E3” or “CAUTION = E4” error message on the display.

3.3. ELEVATION MOTOR DRIVE

3.3.1. MECHANICS

The elevation of the machine is varied by the elevation motor which, by means of a timing belt, turns the lead screw nuts on the 2 elevation bars. The motor has an integral encoder wheel which, by means of a photocell, provides the motor motion control signal: each motor revolution corresponds to a predetermined number of pulses and to a predetermined displacement on the elevation bars.
The direction of rotation of the motor determines whether the treadmill moves upward or downward.

3.3.2. THE RESET PROCEDURE

On power-up, the machine performs a reset procedure in order to determine the reference incline. The procedure consists of the following steps:

- Downward movement of the machine until the lower limit switch is pressed. This is the reference "zero position" for the incline: all the movements for reaching different elevations will be variations referred to this reference.
- Upward movement of the machine until the machine reaches the established 0.0% incline position.

3.3.3. CONTROLS

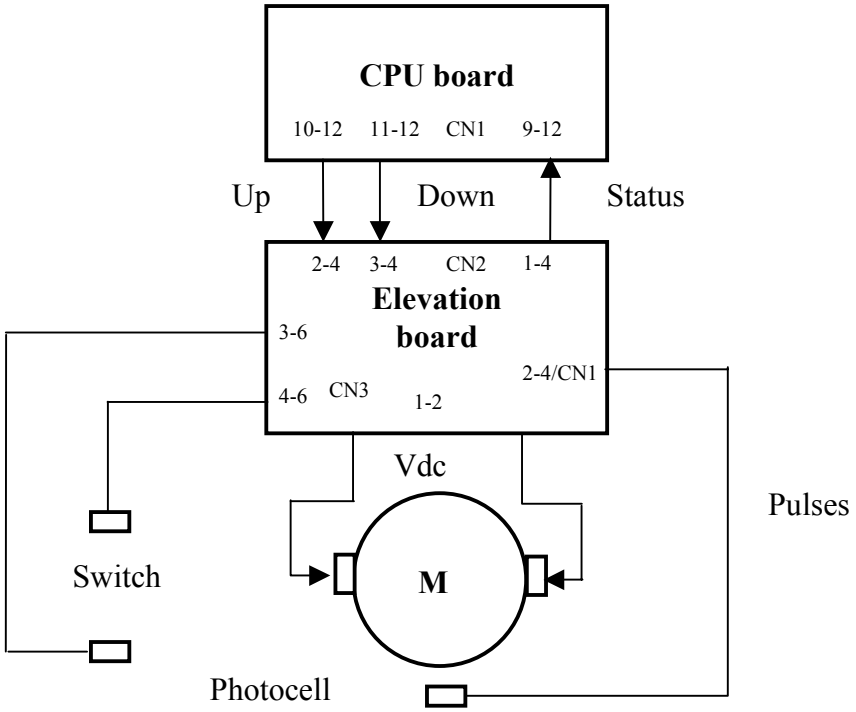
To vary the incline, the CPU board sends the elevation board an Up signal (move motor in the up direction to increase the elevation) or a Down signal (move motor in the down direction to decrease the elevation). The elevation board accordingly actuates the motor the appropriate direction, by supplying it with a positive or negative voltage. When the motor moves, the photocell generates the pulses which are received by the elevation board. The elevation board counts the pulses received and, when the number corresponds to a 0.5% variation in the incline, toggles the level of the Status signal transmitted to the CPU board. The CPU board counts the number of Status signal transitions received. When this value corresponds to the desired incline, it resets the Up or Down signal which produced the movement.

During the reset at the start up, if after having asserted the Up or Down signal, the CPU board does not receive any Status signal within a predetermined period of time (a few seconds), it resets the asserted signal and displays error code "CAUTION = E5" to indicate absence of movement.

In that condition, the SW enables the machine to move the belt and shows on the display the elevation of -0.5%.

3.3.4. THE SIGNALS INVOLVED

The machine controls the elevation through the CPU board and the elevation interface board as shown in the figure below:



The elevation control utilizes the following signals:

- **Up signal**
  This is the signal generated by the CPU (pins 10-12 of connector CN1) to enable movement of the elevation motor in the upward direction. Under normal conditions the signal is at logic level low (0 Vdc), and it goes high (4.2 Vdc) to actuate the motor. The signal remains high for the entire duration of the movement.
  The signal enters the elevation board (pin 2-4 of connector CN2) and enables movement of the motor in the desired direction.

- **Down signal**
  This is the signal generated by the CPU (pin 11-12 of connector CN1) to enable movement of the elevation motor in the downward direction. Under normal conditions the signal is at logic level low (0 Vdc), and it goes high (4.2 Vdc) to actuate the motor. The signal remains high for the entire duration of the movement.
  The signal enters the elevation board (pin 3-4 of connector CN2) and enables movement of the motor in the desired direction.

- **Motor voltage signal (Vdc)**
  This is the dc voltage generated by the elevation board (pins 1-2 of connector CN3) to supply the elevation motor. Its absolute value is 48 Vdc, and the motor will rotate either clockwise or anticlockwise depending on its polarity. In consequence, the incline of the machine will increase or decrease.

- **Pulse signal**
  This is a square wave signal, alternating between logic level low (0 Vdc) and logic level high (5 Vdc), generated by the photocell in response to movements of the elevation motor. Each pulse corresponds to a slot of the encoder wheel, which is incorporated into and moves with the motor itself. The signal enters the elevation board (pin 2-4 of connector CN1) and is used by the elevation board for controlling the movement.

  The photocell also outputs a direction signal, which varies from logic level high (5 Vdc) to low (0 Vdc) depending on whether the motor is moving in a clockwise or anticlockwise direction. This signal is input to the elevation board (pin 3-4 of connector CN1).

  To operate correctly, the photocell requires a 5 Vdc supply voltage which is provided by the elevation board (pins 1-4 of connector CN1).

- **Status signal**
  This is the square wave signal generated by the elevation board (pin 1-4 of connector CN2) that changes its logic level (level low 0 Vdc and level high 5 Vdc) whenever the elevation board receives from the photocell a number of pulses corresponding to an 0.5% variation in the elevation.

  The CPU board receives this signal (pin 9-12 of connector CN1) which indicates the actual elevation of the machine. Comparing it with the desired elevation value, the CPU determines whether to keep the Up or Down signal asserted to continue the movement or, if the desired elevation has been reached, to reset the Up or Down signal.

- **Limit switch signal**
  This is the signal from the 2 limit switches which determine the machine's range of elevation motion. The lower microswitch is a NC contact input to the elevation board (pin 4-6 of connector CN3). When this contact opens the circuit board inhibits movement in the down direction. The upper microswitch is a NO contact input to the elevation board (pin 3-6 of connector CN3). The upper microswitch is always pressed therefore it provides a NC contact. When this contact opens the circuit board inhibits movement in the up direction.

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4. ACCESSORIES

4.1. CONNECTING TO THE TGS

The machine is connected to the Technogym System by means of the 9 pin male D-connector, situated on the back of the control panel, which provides the RS 232 serial port for connecting the TGS reader. The connecting cable is already directly connected to the TGS reader itself:

TGSRN1: Connecting cable Control panel – Retrofit			
Control panel DB9 male	**Signal**	**Color**	**Retrofit**
1	+12 Vdc	Yellow	8
5	Ground	Green	6
3	Rx	Brown	2
2	Tx	White	1

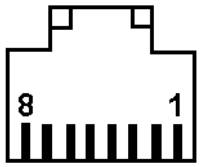
For all further information, including troubleshooting, refer to the following manual: “Wellness System: Installation Guide”.

4.2. CONNECTING TO THE CARDIO THEATER

The machine is connected to the Cardio Theater by means of an RJ45 connector which has the following pin out:

RJ45 Connector	Signal
5	+5 Vdc
7	Ground

On the RJ45 connector, which is illustrated below, pin 1 is the one on the far right, with the locking tab facing upward.



The remaining pins are not connected.

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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 1800 Watt.
9. Do not connect other machines or users to the same wall outlet.
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. For machines shipped in cartons, the side uprights and handles are disassembled and placed on the tread belt.
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. Reassemble the components that were removed for transport. Carry out the procedure for reassembling described in the “Operator and Service manual” supplied with each machine.
5. Connect the mains lead to the input socket on the machine.
6. Place the on/off switch in the “0” position.
7. Plug the mains lead into the electrical output.

5.3. FIRST POWER-ON

After completing the installation procedure, the machine is ready to be powered up. 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;
- resets the elevation.

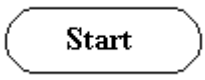
At the end of the power-on test the machine enters standby mode, awaiting a keyboard command.

To check the correct operation of the machine:

- get on the machine;
- press the "Start" key on the keyboard to begin exercising;
- check that the belt motor starts;
- press the "+" and "–" keys on the keyboard and check that the tread belt speed changes accordingly;
- press the "↑" and "↓" keys on the keyboard and check that the machine elevation changes accordingly;
- press the emergency button and check that the tread belt stops;
- put on the heart rate transmitter and check that the machine correctly measures the heart rate value;
- grasp the sensors and check that the machine correctly measures the heart rate value.

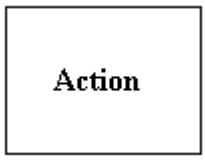
6. TROUBLESHOOTING

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:

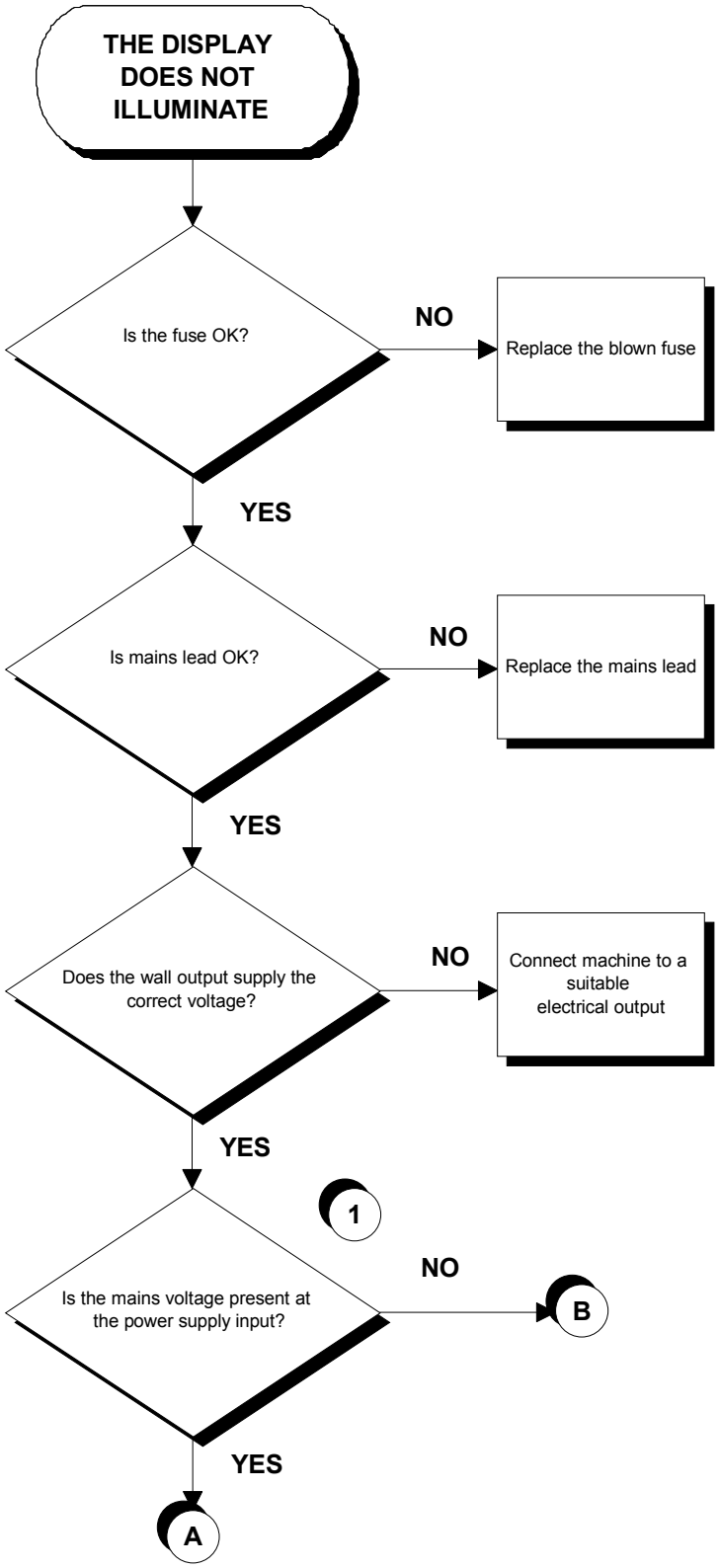
1. Check whether the problem has been resolved;
2. If the problem persists, it is recommended to resume the troubleshooting procedure from the point before the action was carried out.

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

This error is generated when the supply voltage does not reach the control panel.



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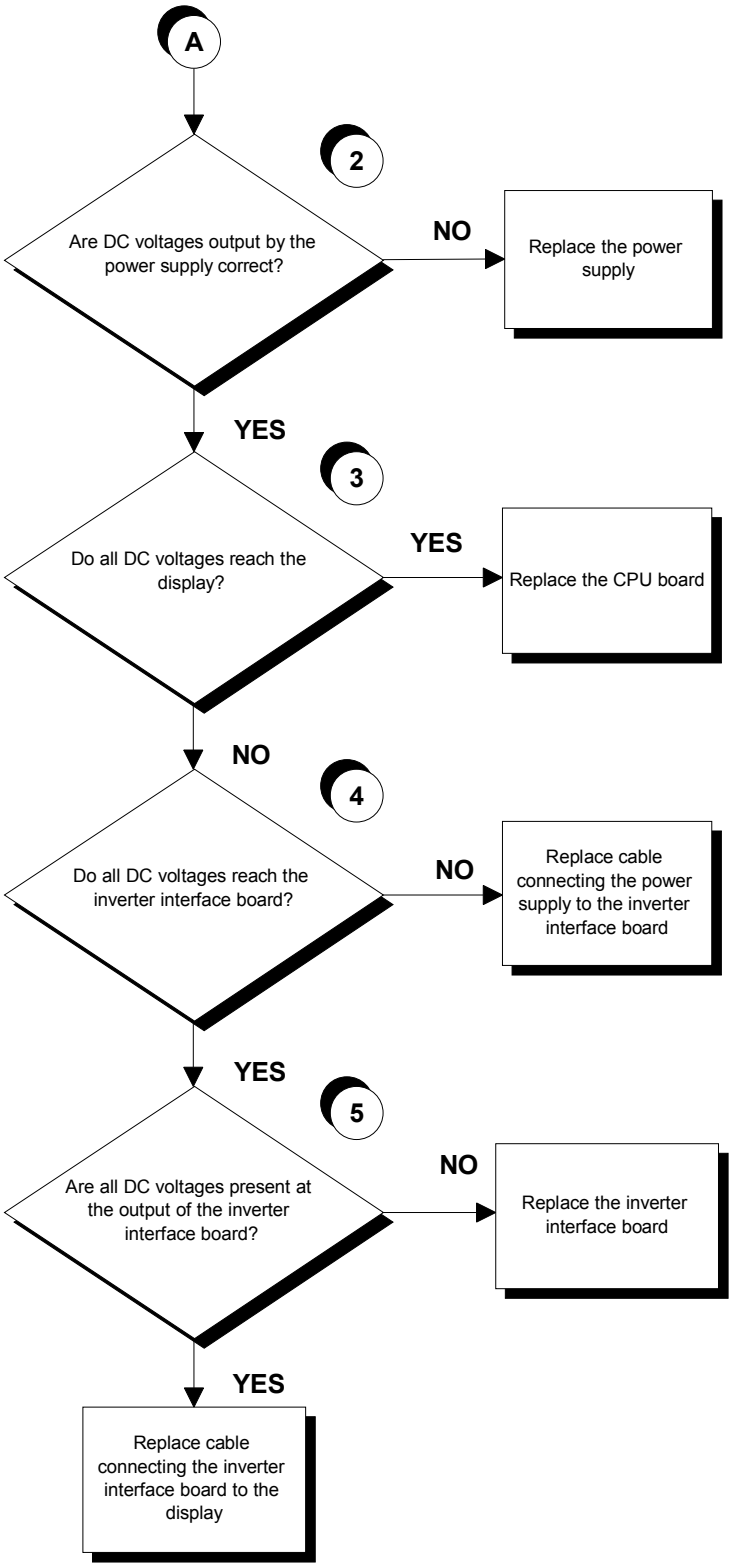

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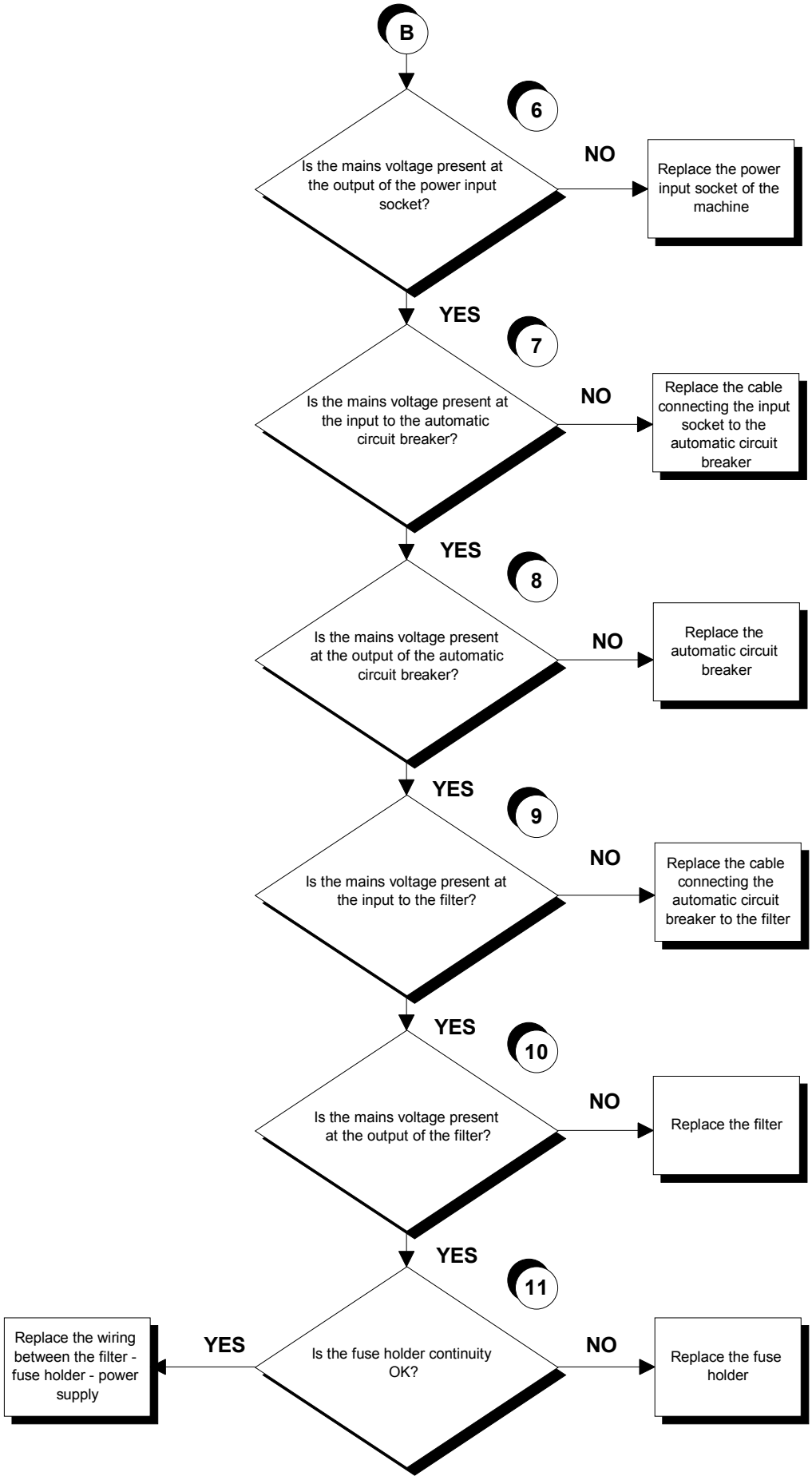

B
6
Is the mains voltage present at the output of the power input socket?
NO
Replace the power input socket of the machine
YES
7
Is the mains voltage present at the input to the automatic circuit breaker?
NO
Replace the cable connecting the input socket to the automatic circuit breaker
YES
8
Is the mains voltage present at the output of the automatic circuit breaker?
NO
Replace the automatic circuit breaker
YES
9
Is the mains voltage present at the input to the filter?
NO
Replace the cable connecting the automatic circuit breaker to the filter
YES
10
Is the mains voltage present at the output of the filter?
NO
Replace the filter
YES
11
Is the fuse holder continuity OK?
NO
Replace the fuse holder
YES
Replace the wiring between the filter - fuse holder - power supply

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) Slightly lift connector CN1 on the power supply. Place the tester probes between pins 4 and 6 on that connector. The measured voltage should be approximately 220 VAC or 110 VAC depending on the type of mains electricity supply.

(2) Slightly lift connector CN2 on the power supply in order to access the pins with the tester probes. Check that all the output voltages of the power supply are correct by referring to paragraph 2.5. "Wiring diagram for the 220 model with non-coded receiver".

(3) As for point (2) but on connector CN1 of the CPU board.

(4) As for point (2) but on connector CN4 of the inverter interface board.

(5) As for point (2) but on connector CN2 of the inverter interface board.

(6) Slightly lift the Fastons on the machine power inlet socket. Place the tester probes between the live and neutral terminals of the connector. The measured voltage should be approximately 220 VAC or 110 VAC depending on the type of mains electricity supply.

(7) As for point (6) but on the input of the automatic circuit breaker.

(8) As for point (6) but on the output of the automatic circuit breaker.

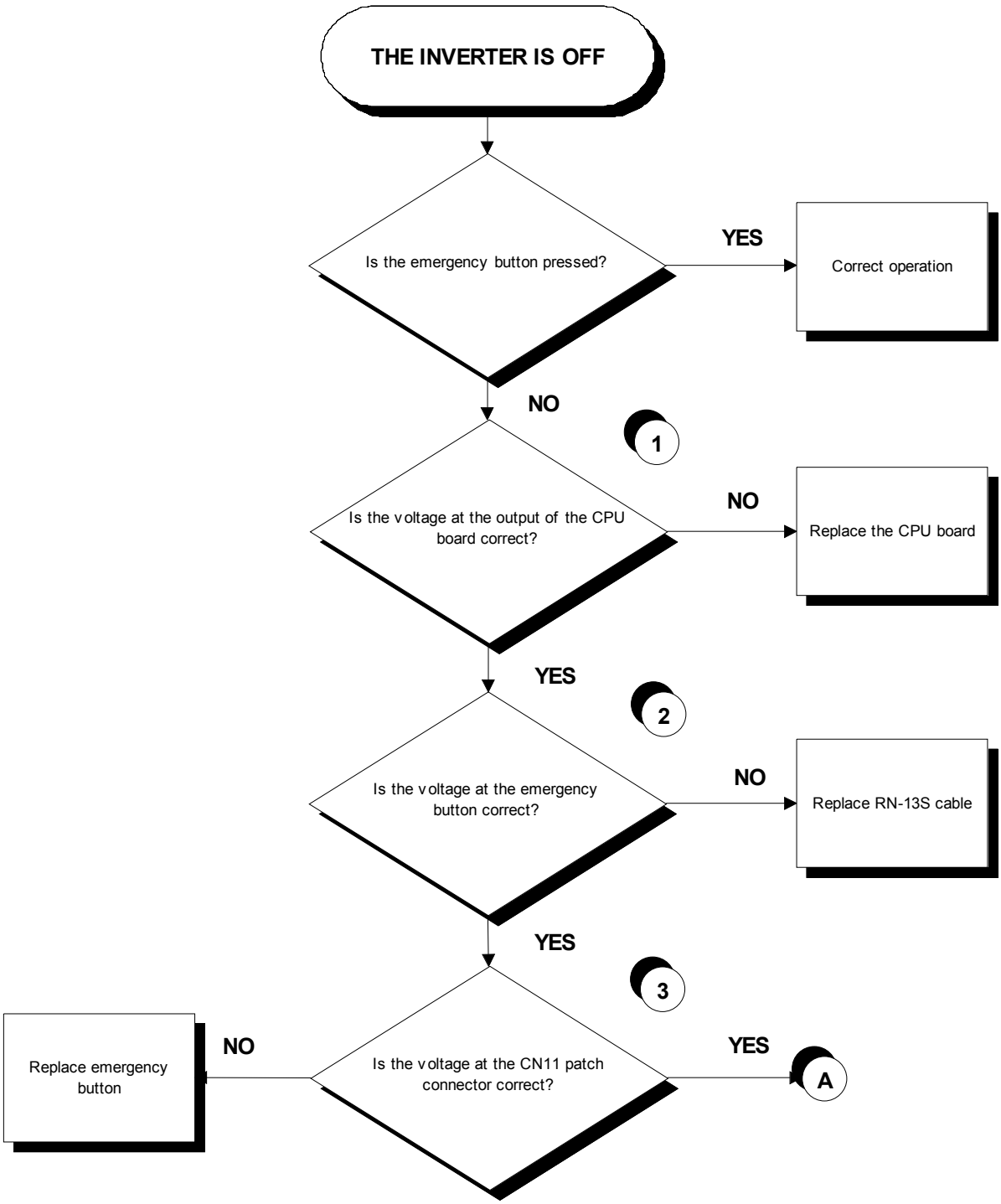
(9) As for point (6) but on the input of the filter.

(10) As for point (6) but on the output of the filter.

(11) Using the tester probes, check the continuity of the fuse holder by measuring its resistance. This is correct if the measured value is less than a few Ohms.

6.2. THE INVERTER IS OFF

This condition is related to emergency button or relay.



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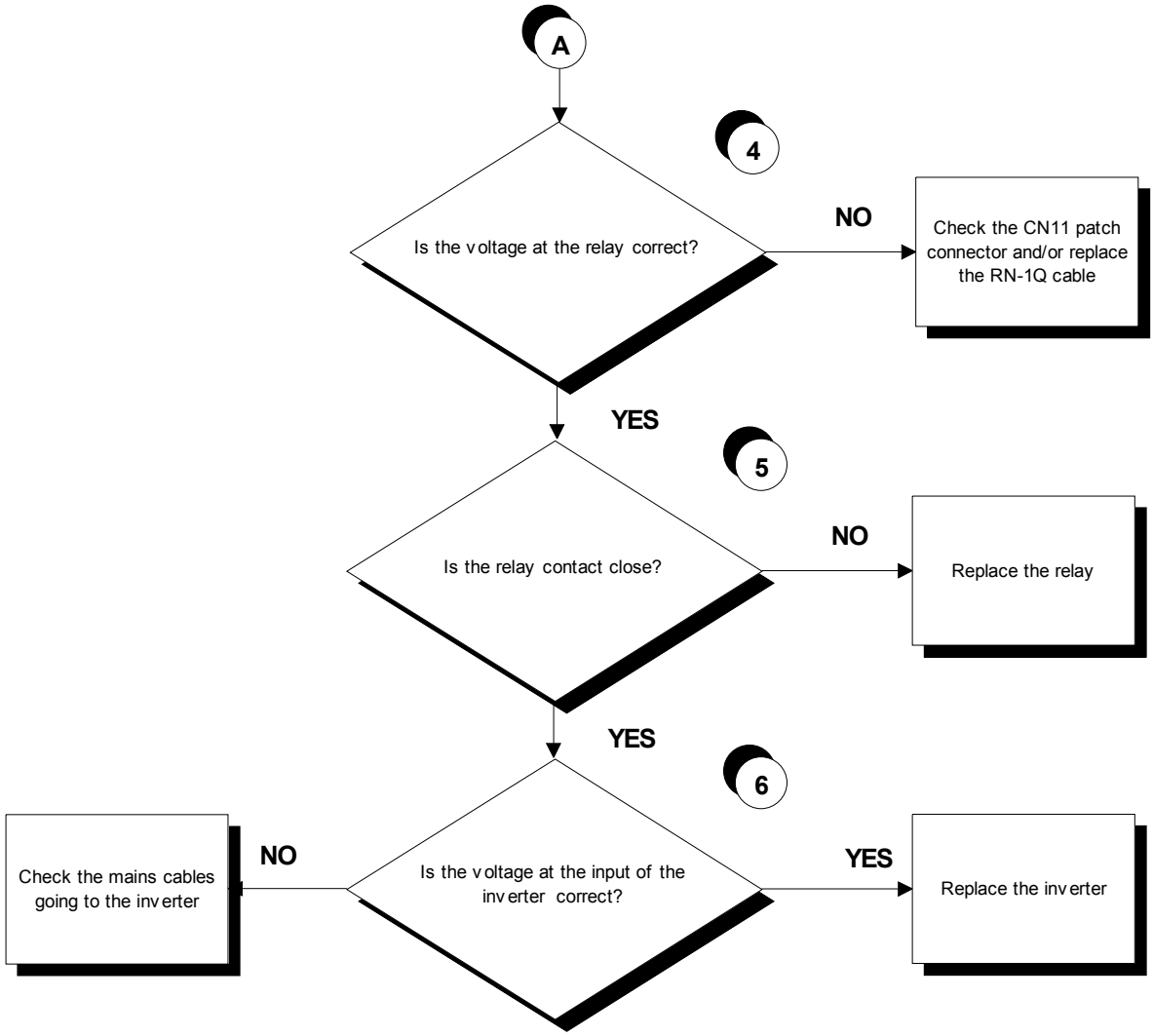


Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

1. Place the tester probes between pins 1 and 3 of the CPU board. The measured voltage should be +12Vdc.

2. As for point (1) but on pin 1 and 4 of the emergency button.

3. As for point (1) but on patch connector CN11.

4. As for point (1) but on pin 0 and 1 of the relay.

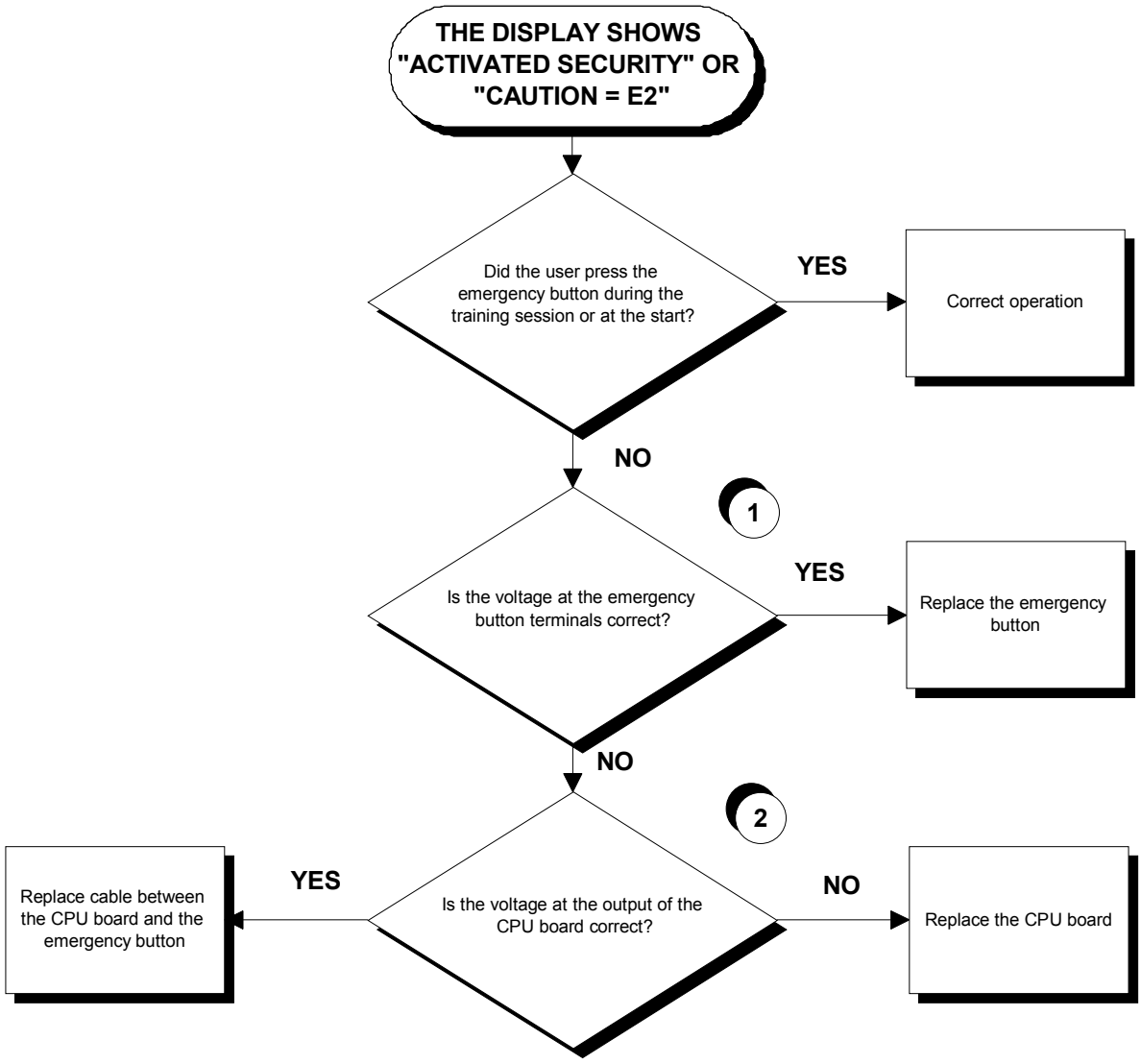
5. Place the tester probes between pins 6 and 8 of the relay. The measured voltage should be 0 Ohm.

6. Place the tester probes between pins L1 and N of the inverter. The measured voltage should be 220 VAC.

6.3. THE DISPLAY SHOWS “ACTIVATED SECURITY” OR “CAUTION = E2”

These messages are related to the emergency button. The machine displays:

- ACTIVATED SECURITY if it is pressed during a training session.
- CAUTION = E2 if it is pressed at the start of a training session.



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 the terminals of the emergency button. When the button is pressed the measured voltage should be +5Vdc, when it is released it should be 0 Vdc.

(2) Place the tester probes between pins 1 and 2 of connector CN2 of the CPU board. The measured voltage should be +5Vdc.

6.4. THE DISPLAY SHOWS “CAUTION = E3” OR “CAUTION = E4”

These messages are related to the belt motor group. The machine displays:

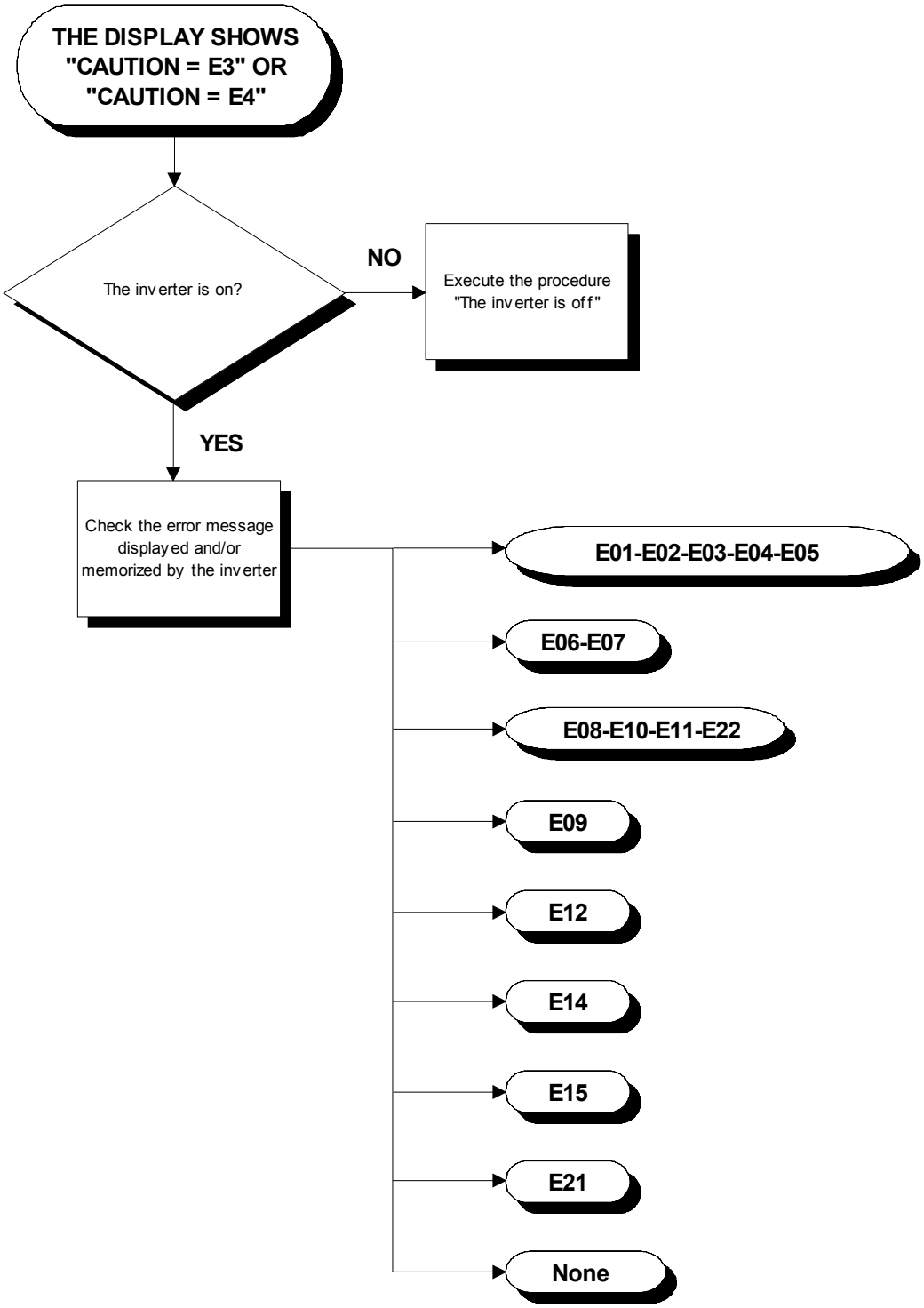
- CAUTION = E3 failure to actuate movement of the belt motor at the start of the training session;
- CAUTION = E4 the movement of the belt motor is interrupted during the training session.

The most common causes are principally:

- One of the motor thermal cutouts has been tripped;
- The inverter has shut down for protection from a mains voltage fluctuation (spike or glitch).

In both cases it is recommended to turn off the machine — for at least one hour in the first case, and for a few minutes in the second case — before resuming normal operation.

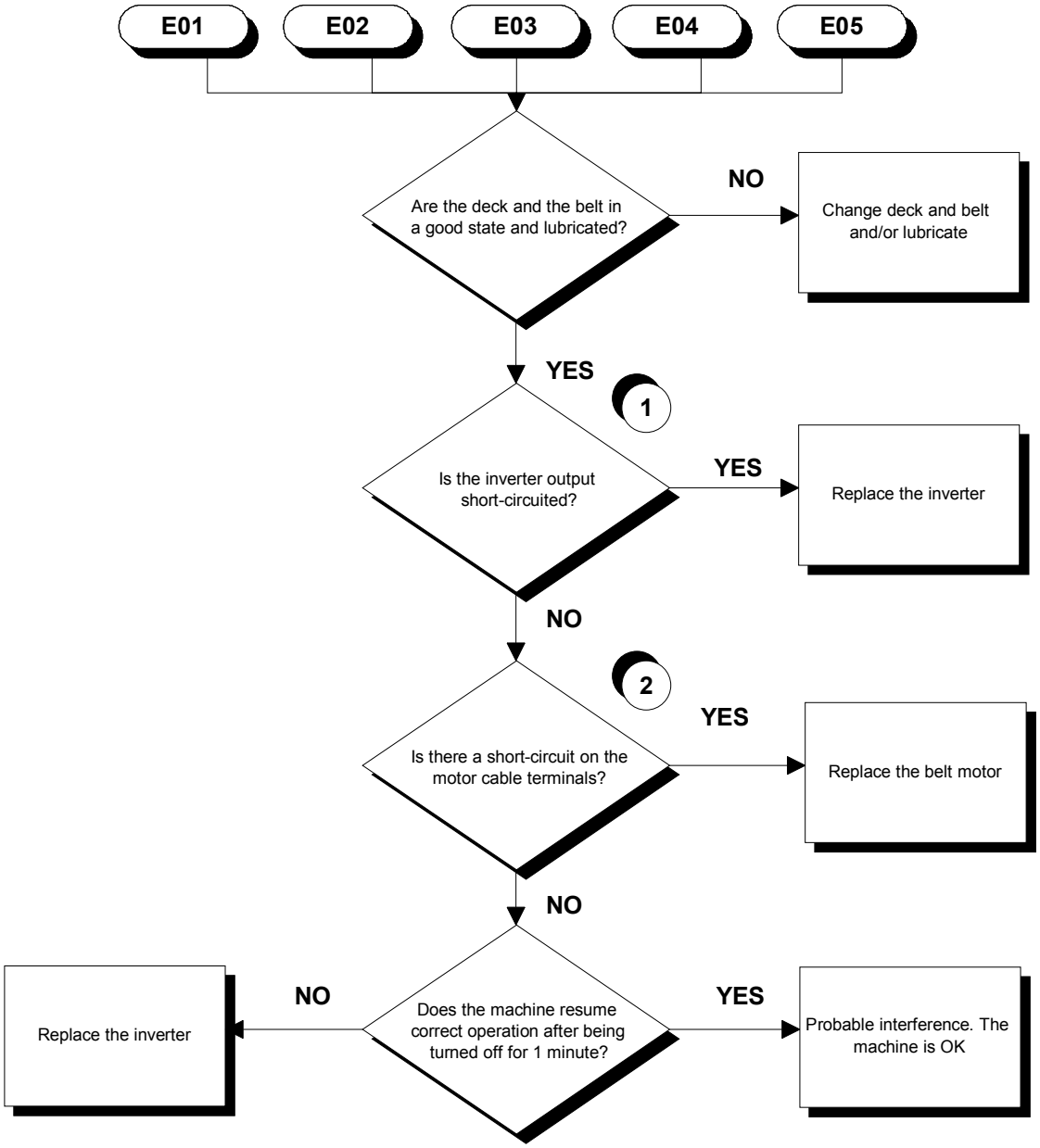
If the machine still does not operate correctly, follow the procedures (which differ depending on the inverter model used) set out in the following paragraphs.



The paragraphs below illustrate the troubleshooting procedures for each individual error code.

6.4.1. THE INVERTER DISPLAY SHOWS E01, E02, E03, E04 OR E05

These inverter error messages are related to output short-circuit problems.



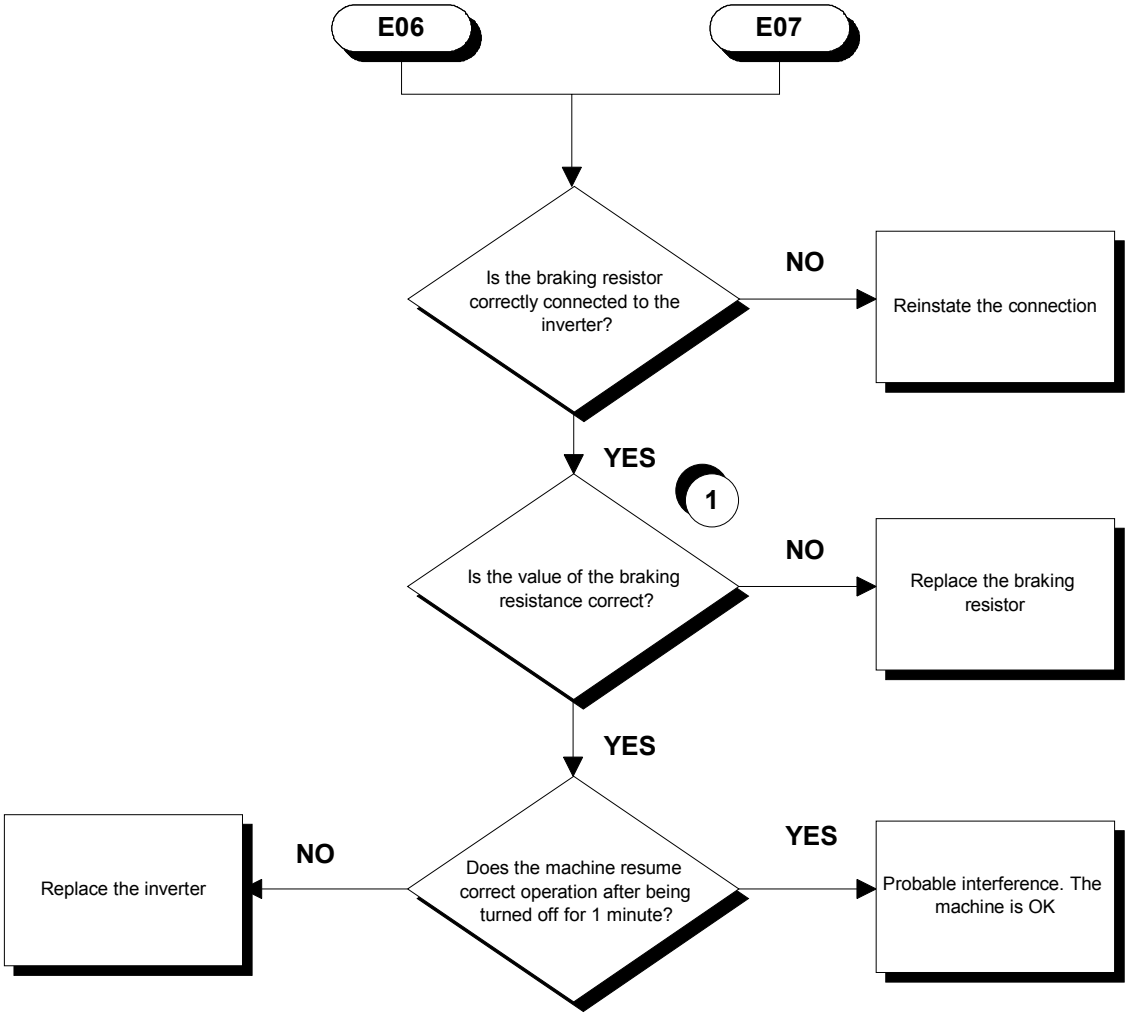
Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

(1) Disconnect the motor cable from the inverter and place the tester probes between its terminals U-V, U-W and V-W. The measured resistance should be very high, in the order of MOhms. It is difficult to obtain a stable resistance measurement, however, a phase can be considered short-circuited or defective when the measured resistance is in the order of a few tens of Ohms.

(2) Disconnect the motor cable from the inverter and place the tester probes across the motor cables connected to terminals U,V,W on the inverter. The measured phase-phase resistance should be approximately 3.1 Ohms.

6.4.2. THE INVERTER DISPLAY SHOWS E06 OR E07

These inverter error messages are related to problems with the inverter braking group or the braking resistor.



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:

(3) With the machine turned off, disconnect one of the resistor wires from the inverter terminal block and place the tester probes across the resistor. The measured resistance should be 150 Ohm.

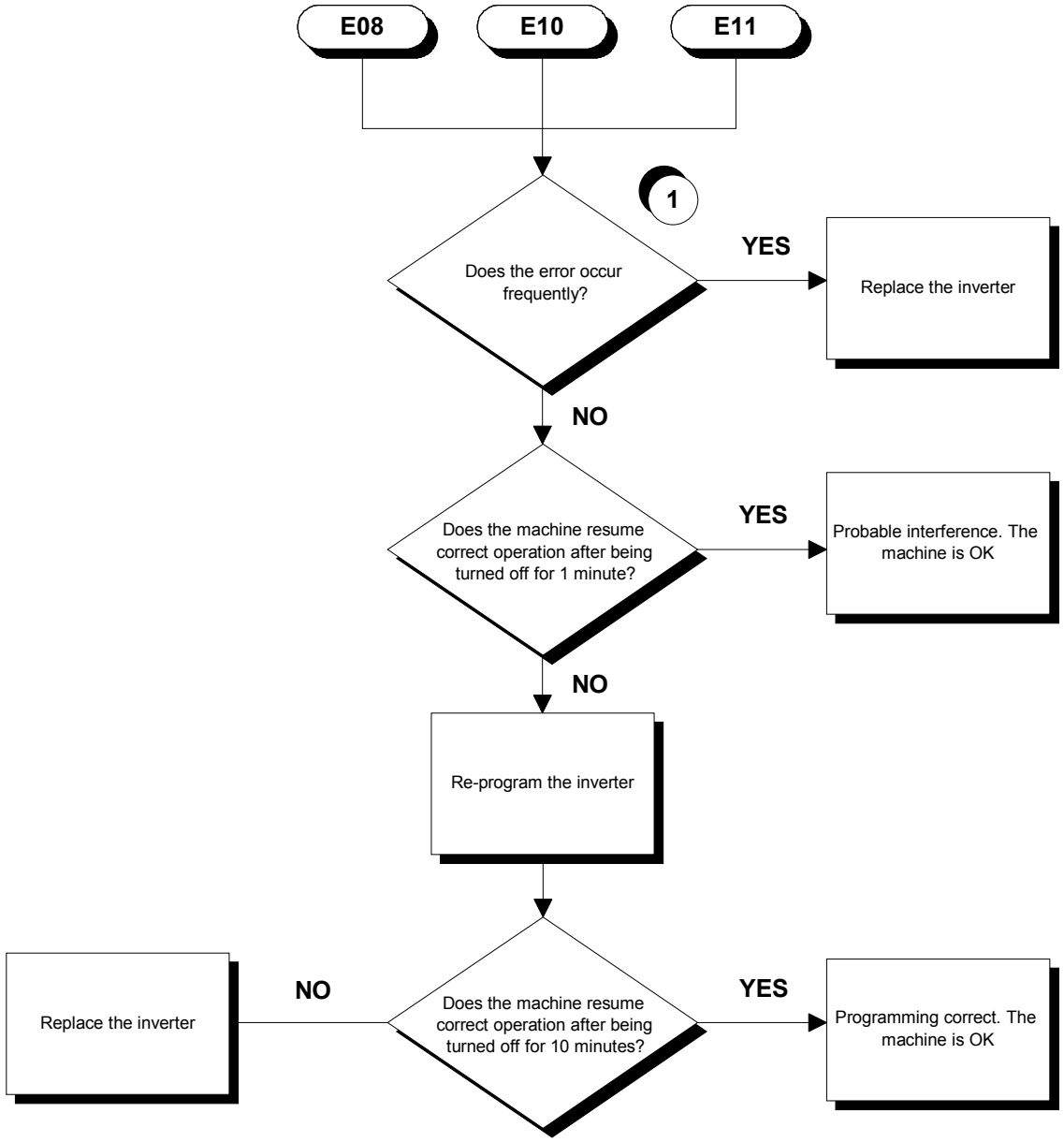
To reduce the occurrences of error E6, it is possible to adjust the following inverter parameter:

- **On model J100: A38;**
- **On model SJ100: b90;**

by increasing its value. This adjustment enables the inverter to increase the use of the braking resistance.

6.4.3. THE INVERTER DISPLAY SHOWS E08, E10 OR E11

These inverter error messages are related to HW and SW problems with the inverter.



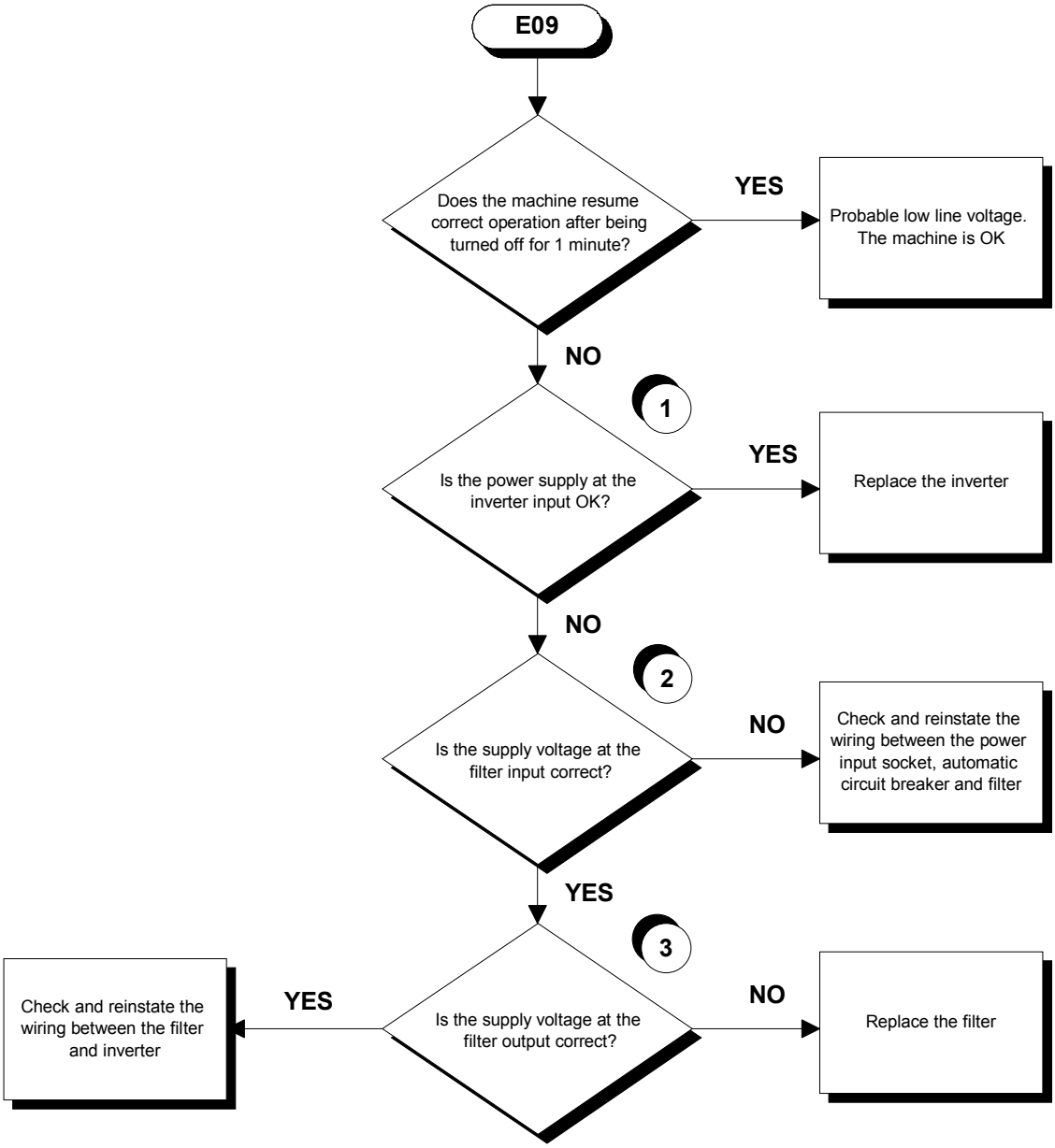
Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

(1) Determine the frequency of the errors by counting the number of occurrences in the inverter error memory, and by running targeted checks. An error is considered frequent if it occurs 2 or 3 times a day.

WARNING: incorrect programming of the inverter can cause serious damage to the machine or malfunctioning that is potentially hazardous to the user. Therefore, attempt this operation only if certain of being able to carry out the procedure with the proper parameters setting.

6.4.4. THE INVERTER DISPLAY SHOWS E09

This inverter error message is related to low line voltage problems on the inverter power supply.



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 terminals L1 and N of the inverter. The measured voltage should be 220 VAC or 110 VAC depending on the type of mains electricity supply.

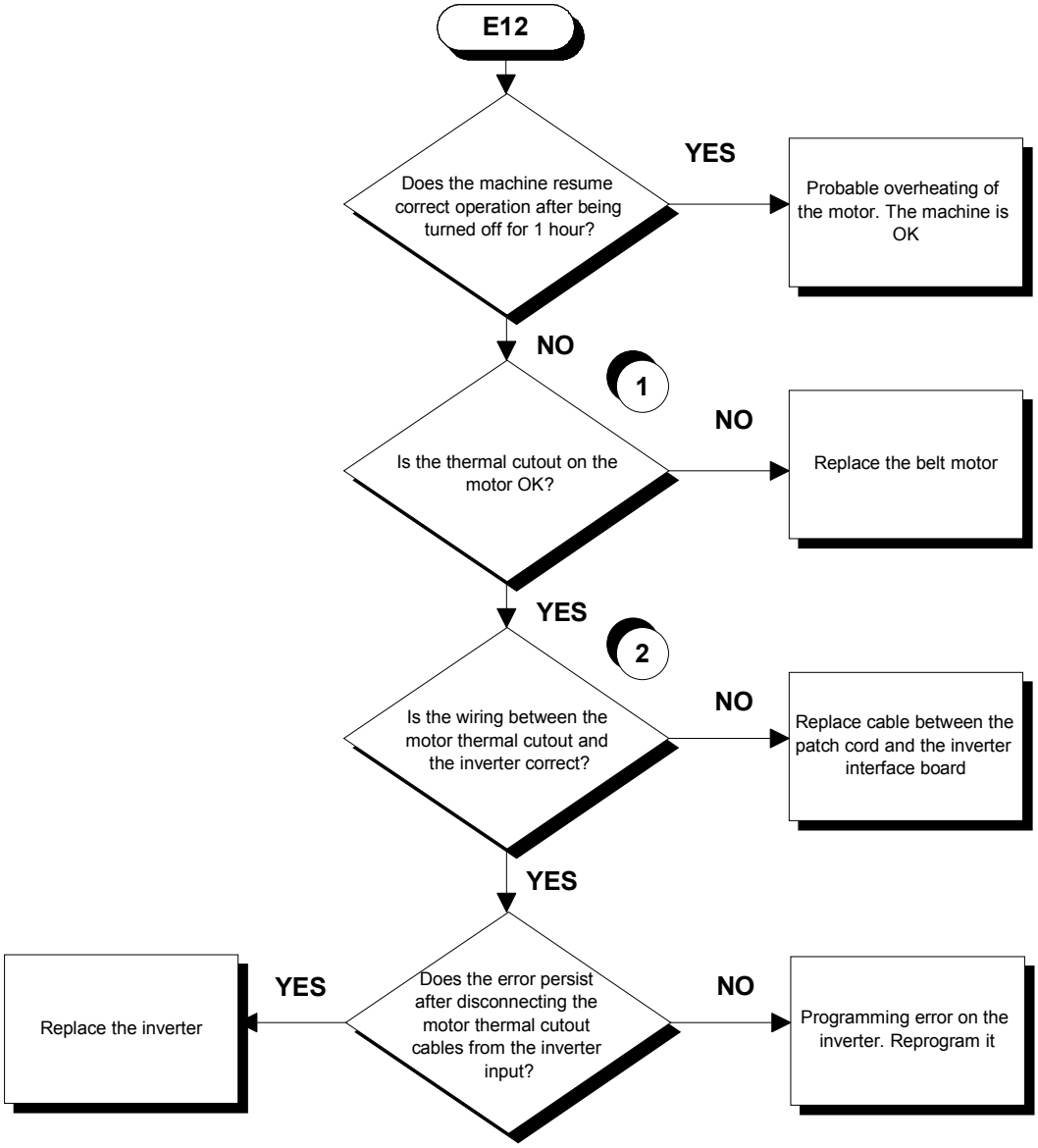
(2) Disconnect the filter power supply cables and place the tester probes on the terminals. The measured voltage should be 220 VAC or 110 VAC depending on the type of mains electricity supply.

(3) Disconnect the filter output cables and place the tester probes across the filter terminals. The measured voltage should be 220 VAC or 110 VAC depending on the type of mains electricity supply.

This error may be generated even by brief drops in the line voltage due to overloads or other causes. Therefore, it can be very useful to check the value of the mains voltage recorded in the inverter memory at the time when the error occurred. To obtain the mains voltage, the displayed value must be divided by 1.41 .

6.4.5. THE INVERTER DISPLAY SHOWS E12

This inverter error message is related to the opening of the motor thermal cutouts.



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:

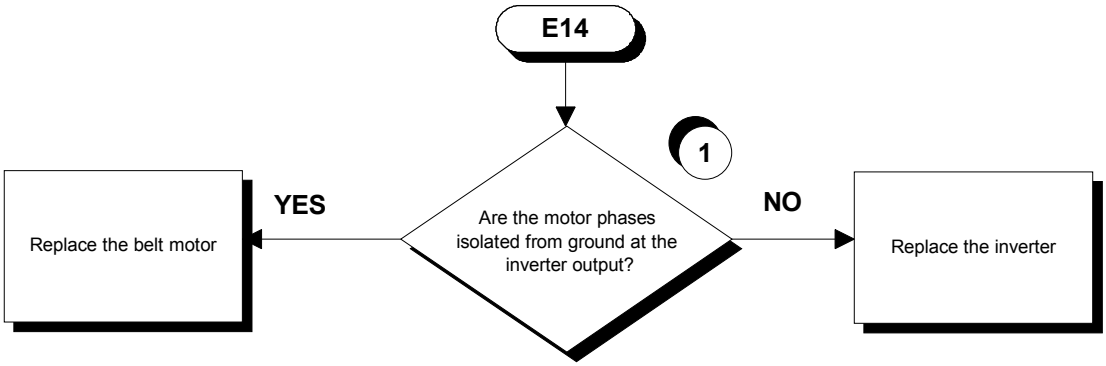
(1) Disconnect the motor thermal cutout cables from the inverter and place the tester probes between their terminals. The measured resistance should be less than 1 Ohm.

In some cases the value may be higher due to oxidation of the contacts. To reinstate correct operation, it is necessary to perform a special operation which will be described to you on contacting the Technogym Service.

(2) Disconnect the motor thermal cutout cables on both the motor and inverter sides, and place the tester probes at either end of each wire. The measured resistance should be 0 Ohm.

6.4.6. THE INVERTER DISPLAY SHOWS E14

This inverter error message is related to poor isolation between the motor phases and ground.

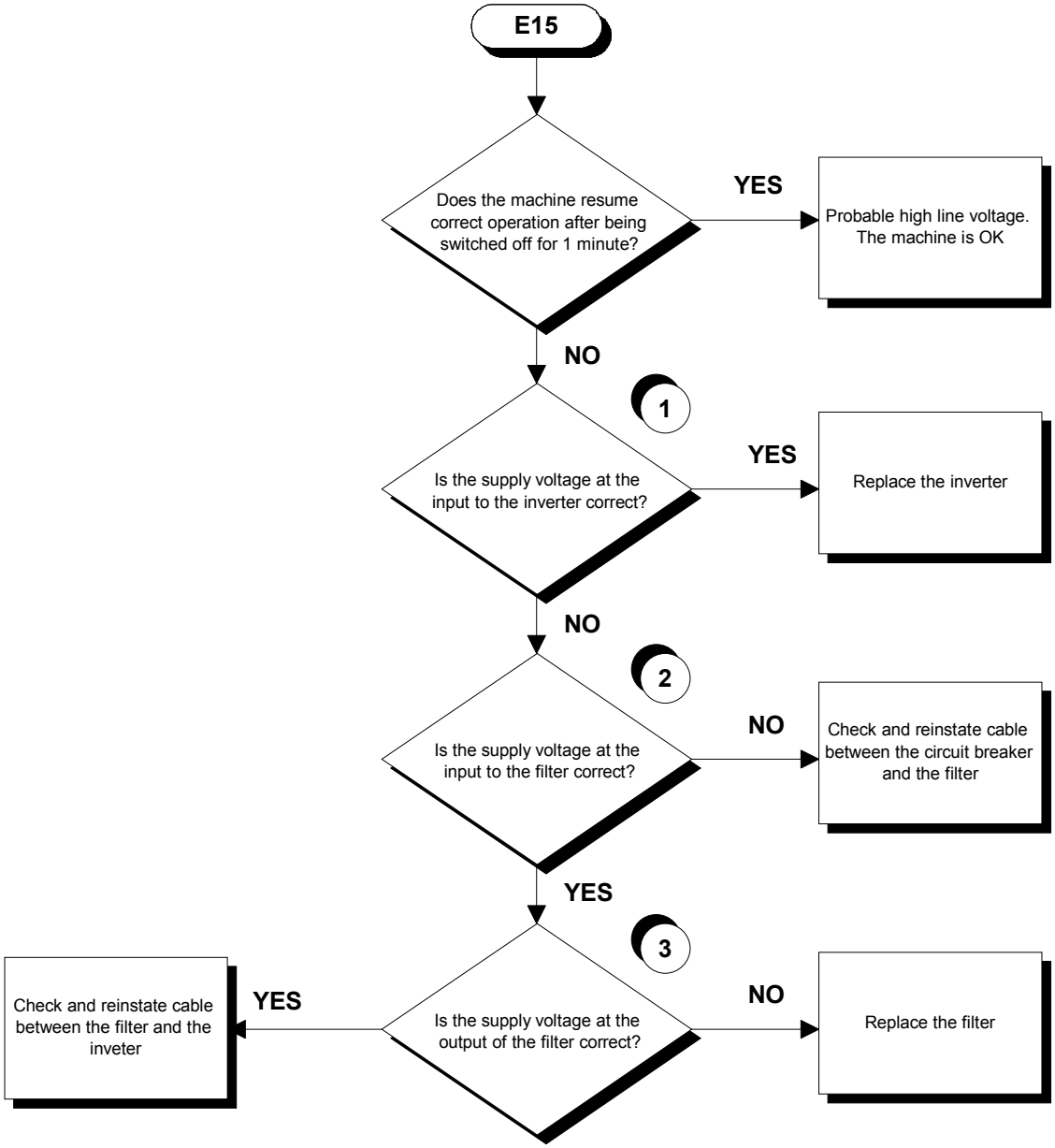


Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

(1) Disconnect the motor cable from the inverter and place the tester probes between terminals U, V and W of the inverter and the ground screw (PE). The measured resistance should be MOhm or higher.

6.4.7. THE INVERTER DISPLAY SHOWS E15

This inverter error message is caused by high voltage problems on the inverter power supply line.



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) Insert the tester probes between terminals L1 and N of the inverter. The measured voltage should be 220 VAC or 110 VAC depending on the type of mains electricity supply.

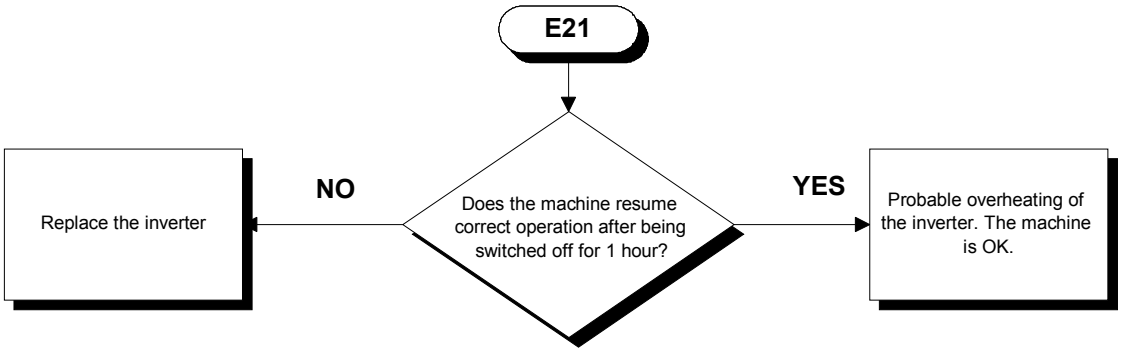
(2) Disconnect the supply cables from the filter and place the tester probes across them. The measured voltage should be 220 VAC or 110 VAC depending on the type of mains electricity supply.

(3) Disconnect the filter output cables and place the tester probes across the filter terminals. The measured voltage should be 220 VAC or 110 VAC depending on the type of mains electricity supply.

This error may be generated even by brief drops in the line voltage due to overloads or other causes. Therefore, it can be very useful to check the value of the mains voltage recorded in the inverter memory at the time when the error occurred. To obtain the mains voltage, the displayed value must be divided by 1.41.

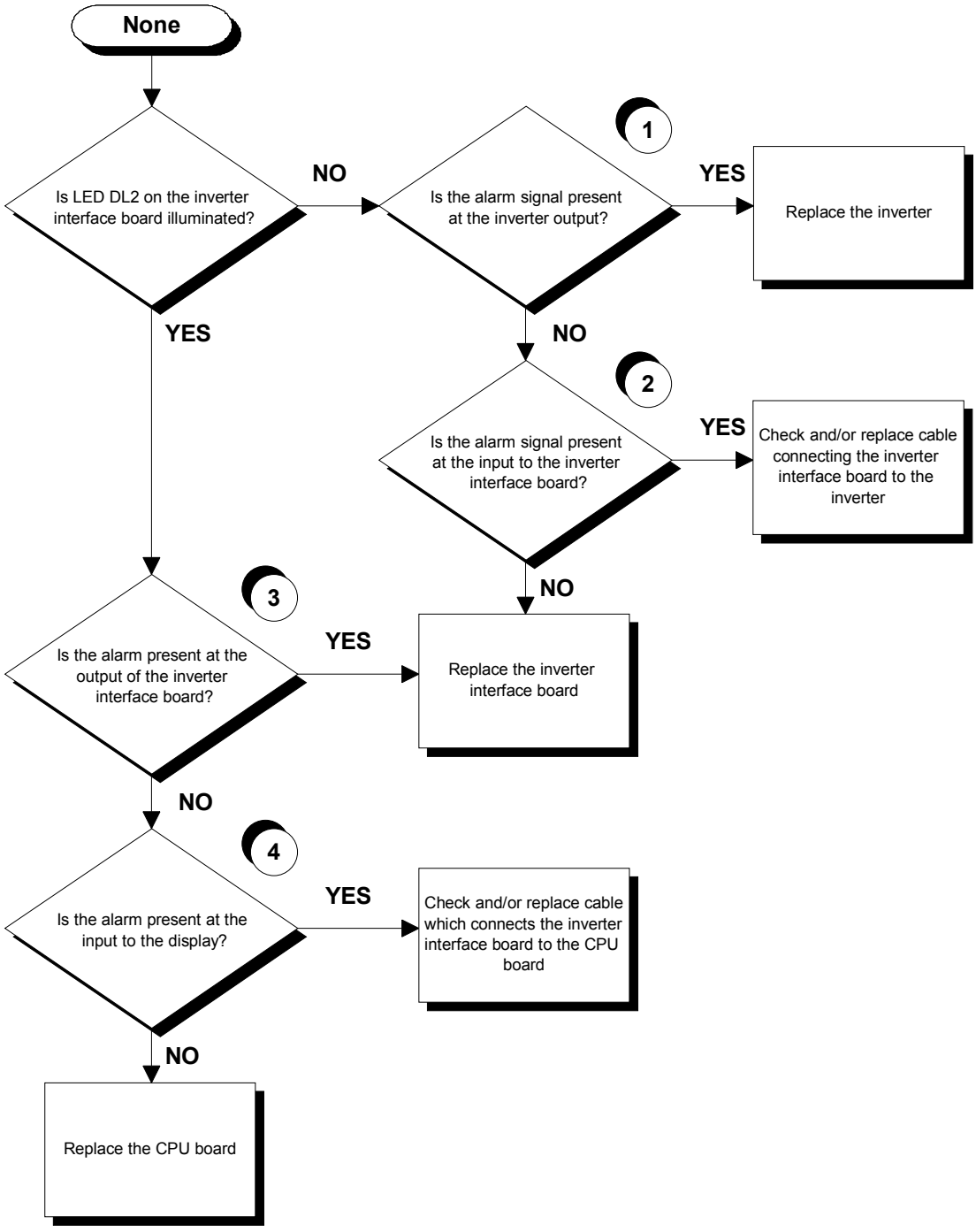
6.4.8. THE INVERTER DISPLAY SHOWS E21

This inverter error message is associated with problems of high inverter temperature.



6.4.9. THE INVERTER DISPLAY DOES NOT SHOW ANY ERROR

This is an anomalous error condition in which the machine display reports an error but the inverter has not generated an error.



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 terminals AL0 and AL1 of the inverter. Under an alarm condition the measured voltage should be +10 Vdc, under normal conditions it should be 0 Vdc.

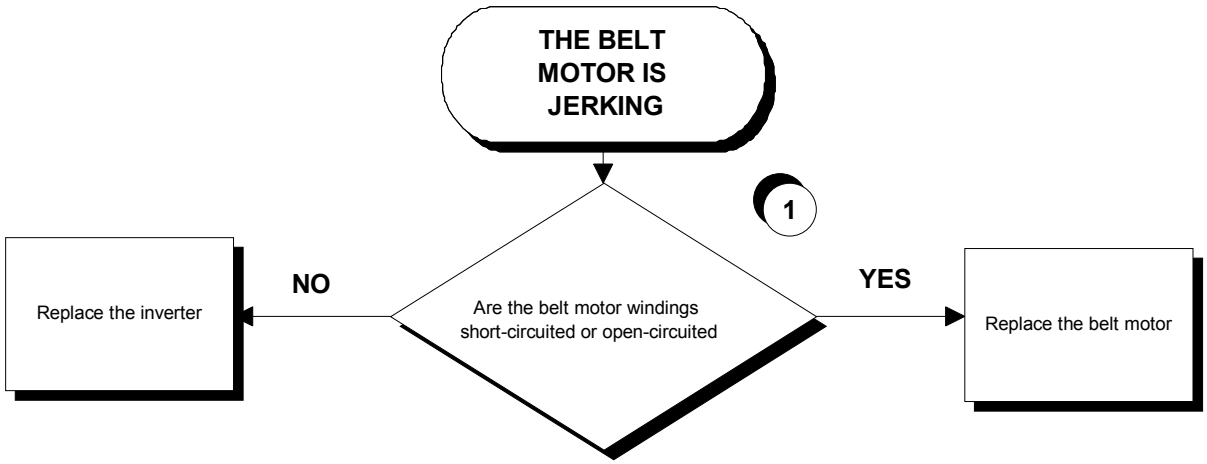
(2) As for point (2) but between pins 3 (signal) and 4 (ground) of connector CN1 on the inverter interface board.

(3) Place the tester probes between pins 3 (ground) and 9 (signal) of connector CN2 on the inverter interface board. Under an alarm condition the measured voltage should be 0 Vdc, under normal conditions it should be +5 Vdc.

(4) As for point (4) but between pins 3 (ground) and 8 (signal) of connector CN1 on the CPU board.

6.5. THE BELT MOTOR IS JERKING

The probable cause of this error is a disconnected phase on the motor or inverter output.

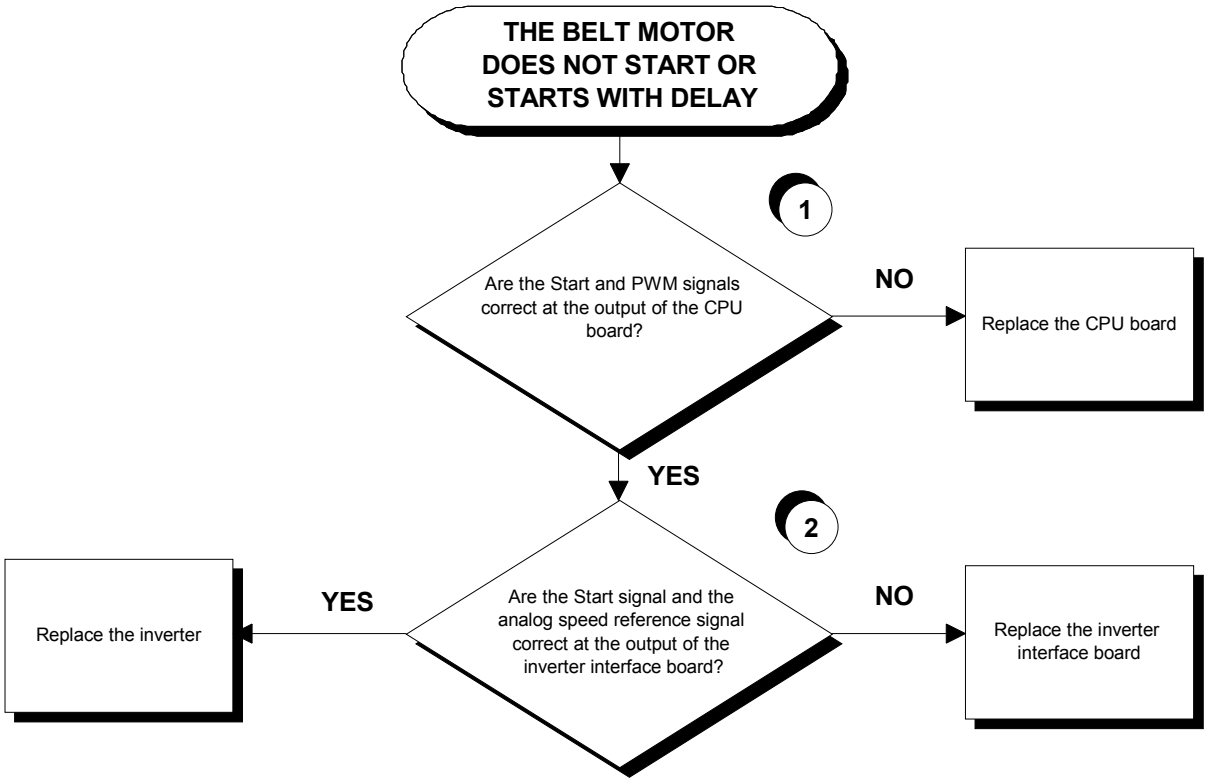


Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

(1) Disconnect the motor cable from the motor and place a tester across its terminals U-V, U-W and V-W. The measured resistance should be approximately 3.1 Ohm.

6.6. THE BELT MOTOR STARTS WITH DELAY

The problem is caused by the inverter failing to receive the enable signal (Start) or the speed 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) To check the Start signal, place a tester between pins 7 (signal) and 3 (ground) of connector CN1 on the CPU board. When the belt is halted the measured voltage should be 0 Vdc, whereas immediately after pressing the “Start” key on the display the measured voltage should be 4.8 Vdc.
To check the PWM signal, place a tester between pins 6 (signal) and 3 (ground) of connector CN1 on the CPU board. When the belt is halted the measured voltage should be 5 Vdc, whereas immediately after pressing the “Start” key on the display the reading should rapidly decrease until it reaches a fixed value corresponding to the selected speed. The variation of the signal must be accompanied by a corresponding variation in the tread belt speed: see Table 6.7-1 or Table 6.7-2.

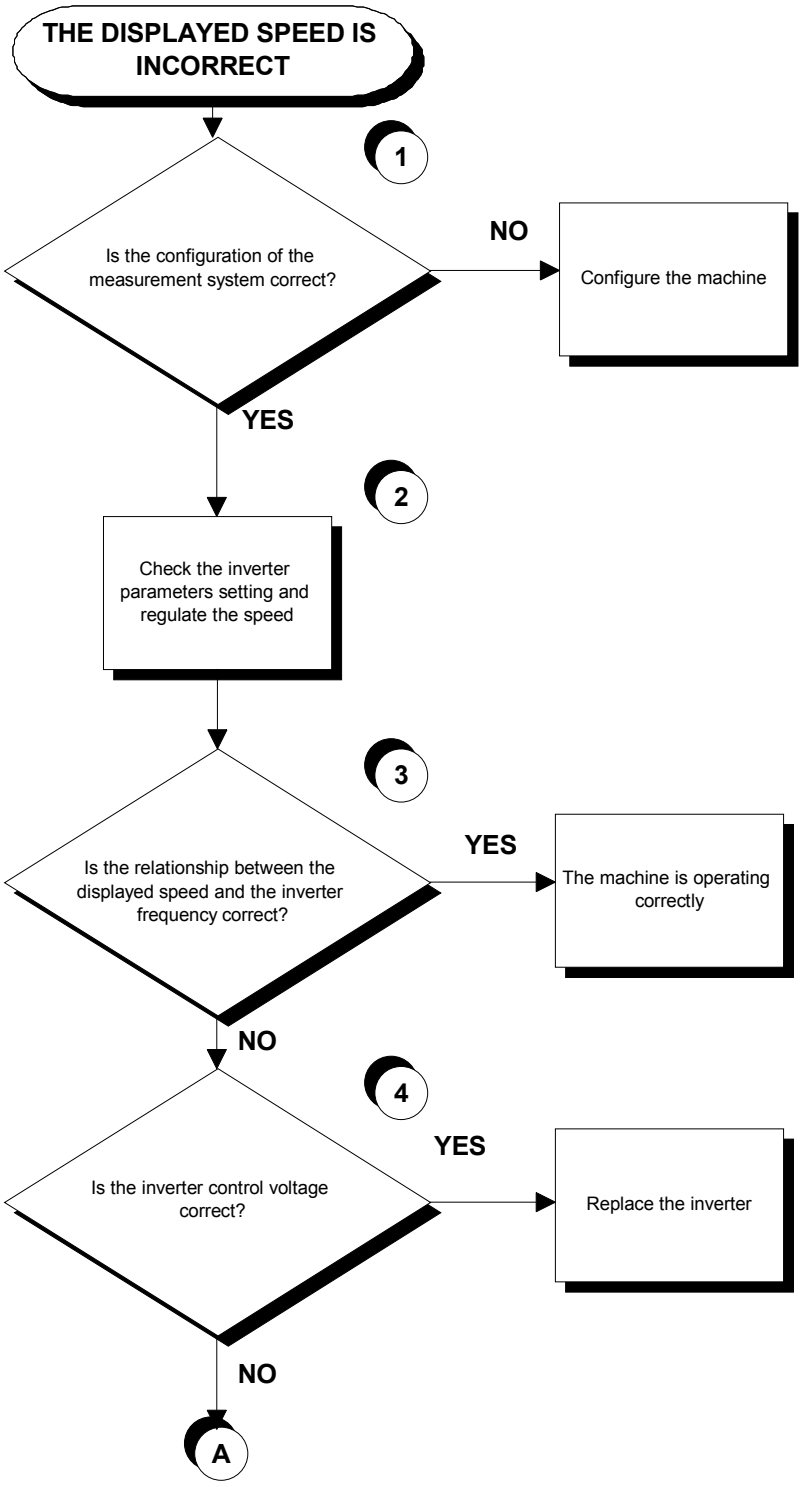
(2) To check the Start signal, place a tester between pins 2 (signal) and 1 (ground) of connector CN1 on the inverter interface board. When the belt is halted the reading should be -25.3 Vdc, whereas immediately after pressing the “Start” key on the display the measured value should be -2.7 Vdc.
To check the analog speed reference signal, place a tester between pins 5 (signal) and 6 (ground) of connector CN1 on the inverter interface board. When the belt is halted the measured value should be 0 Vdc, whereas immediately after pressing the “Start” key on the display the reading should rapidly increase to reach a fixed value corresponding to the selected

speed. The variation of the signal must be accompanied by a corresponding variation in the belt speed: see Table 6.7-1 or Table 6.7-2.

6.7. THE DISPLAYED SPEED IS INCORRECT

The machine displays this error if:

- the calibration is incorrect;
- there are HW problems with the CPU board – driver board – inverter and motor group.



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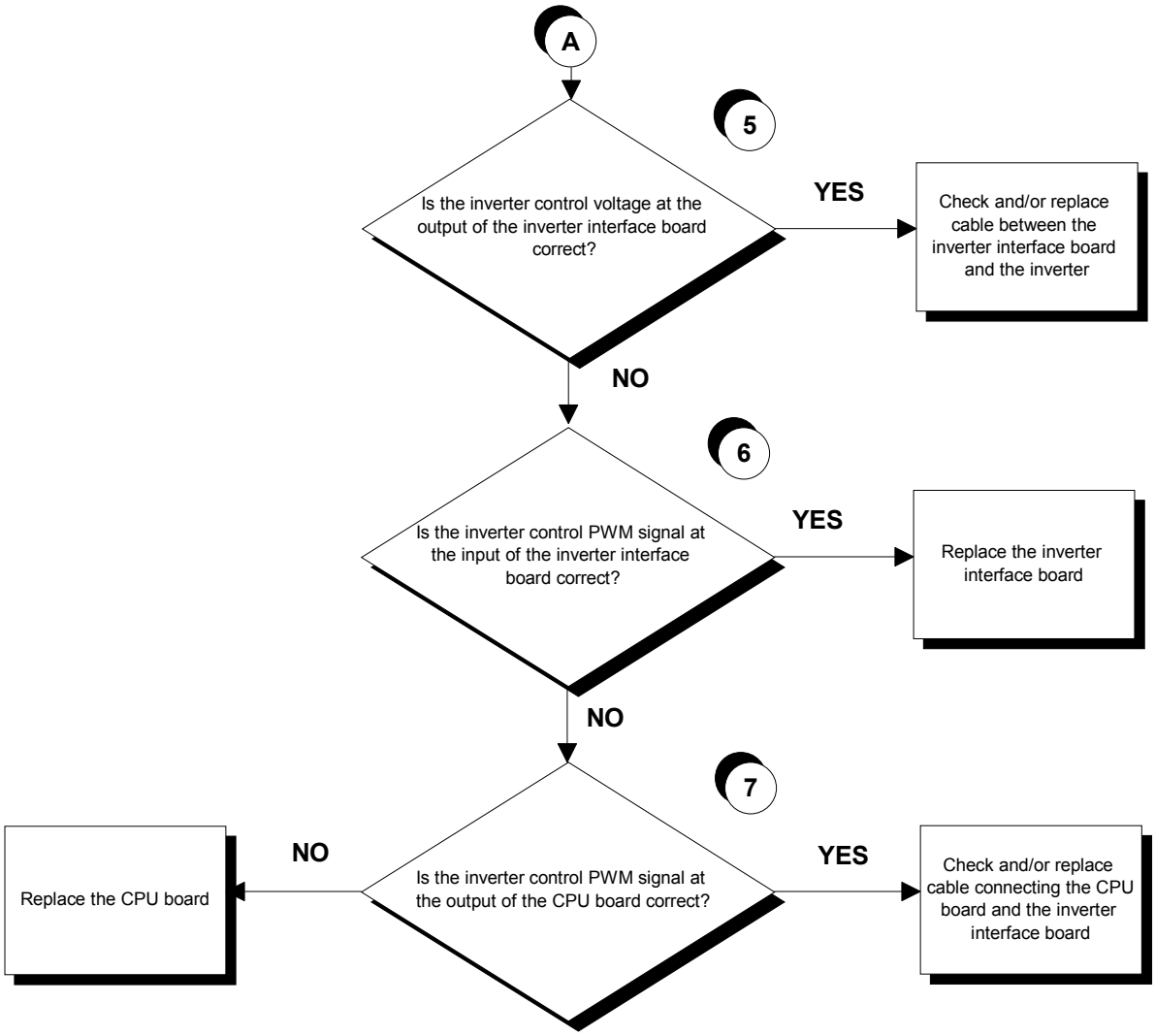


Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

(1) See paragraph 9.1.2. “Measurement system”.

(2) See paragraphs 9.5. and 9.6. to set the inverter and 8.7. to regulate the speed.

(3) When the machine is in operation, check that the speed shown on the machine display and inverter operating frequency correspond to the values shown in the tables below.

- For versions with speed expressed in km/h:

Speed (Km/h)	PWM signal (Vdc)		Analog signal (Vdc)		Frequency (Hz)
CPU board		Inverter interface board		Inverter	
Display	6-3/CN1	10-3/CN2	5-6/CN1	L-O	Display
2.0	4.42	4.42	1.09	1.09	11.0
5.0	3.51	3.51	2.73	2.73	27.3
9.0	2.30	2.30	4.89	4.89	49.3
12.6	1.20	1.20	6.85	6.85	69.0
16.0	0.17	0.17	8.70	8.70	87.6

Table 6.7-1

- For versions with the speed expressed in mph:

Speed (mph)	PWM signal (Vdc)		Analog signal (Vdc)		Frequency (Hz)
CPU board		Inverter interface board		Inverter	
Display	6-3/CN1	10-3/CN2	5-6/CN1	L-O	Display
1.0	4.48	4.48	0.88	0.88	8.7
3.0	3.52	3.52	2.61	2.61	26.3
5.0	2.70	2.70	4.35	4.35	43.9
7.0	1.61	1.61	6.09	6.09	61.6
9.0	0.65	0.65	7.82	7.82	79.3

Table 6.7-2

Obviously, the voltages and frequencies quoted above are nominal values.

For the Hitachi J100 inverter, the data given in the above tables will be slightly different, but still comparable.

(4) Place the tester probes between the terminals O (signal) and L (ground) of the inverter. Check that during machine operation the speed shown on the display and the voltage measured on the inverter correspond to the values shown in Table 6.7-1 or in Table 6.7-2.

(5) Place the tester probes between pins 5 (signal) and 6 (ground) of connector CN1 on the inverter interface board. Check that during machine operation the speed shown on the display and the measured voltage correspond to the values shown in Table 6.7-1 or in Table 6.7-2.

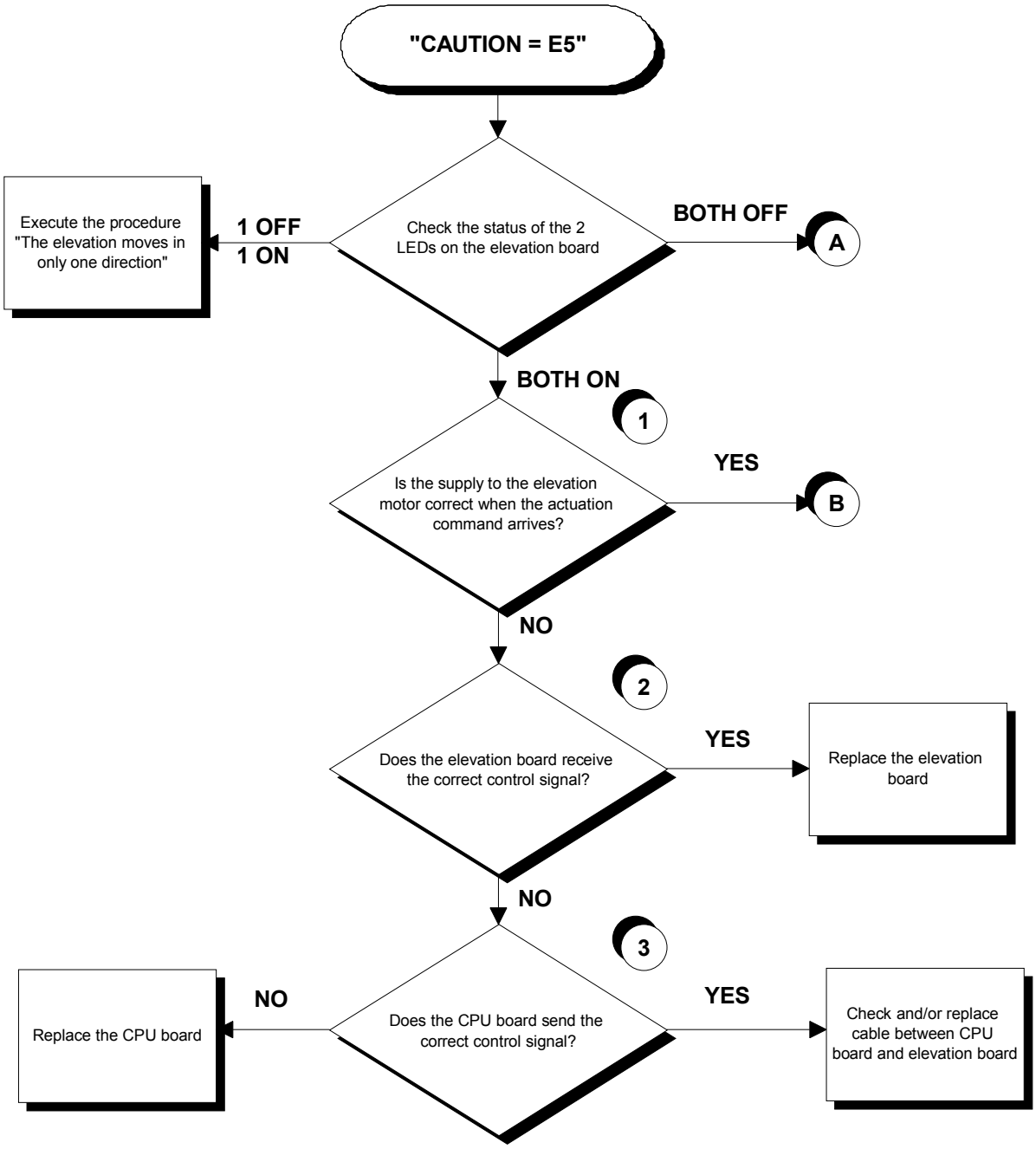
(6) Place the tester probes between pins 10 (signal) and 3 (ground) of connector CN2 of the inverter interface board. Check that during machine operation the speed shown on the display and the measured voltage correspond to the values shown in Table 6.7-1 or Table 6.7-2.

(7) Place the tester probes between pins 6 (signal) and 3 (ground) of connector CN1 on the CPU board. Check that during machine operation the speed shown on the display and the measured voltage correspond to the values shown in Table 6.7-1 or in Table 6.7-2.

6.8. THE DISPLAY SHOWS “CAUTION = E5”

The machine displays this error if it is unable to control the elevation motor.

Execute the following troubleshooting procedure when the machine does the reset at the start up described at paragraph 3.3.2. “The reset procedure”.



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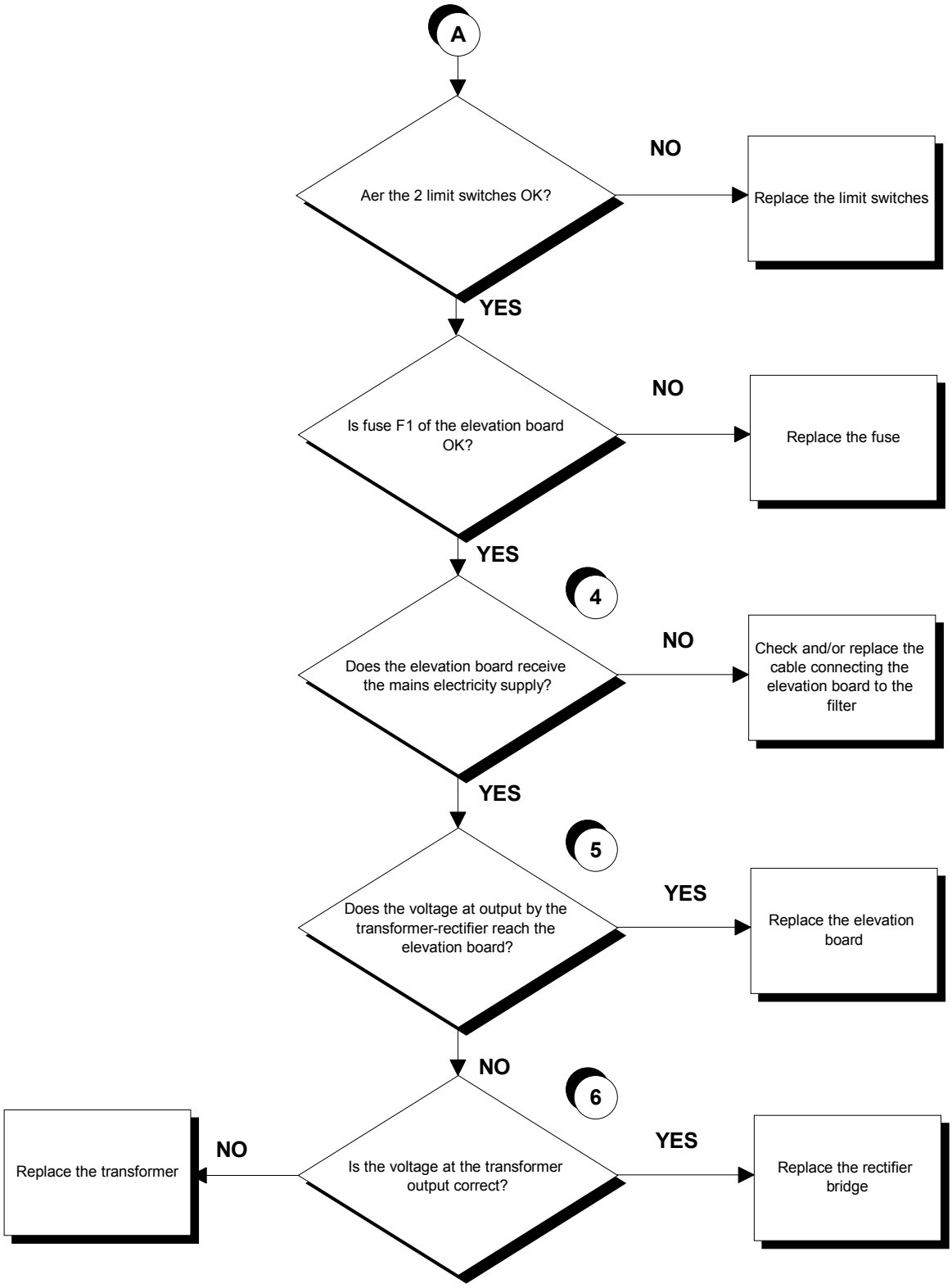

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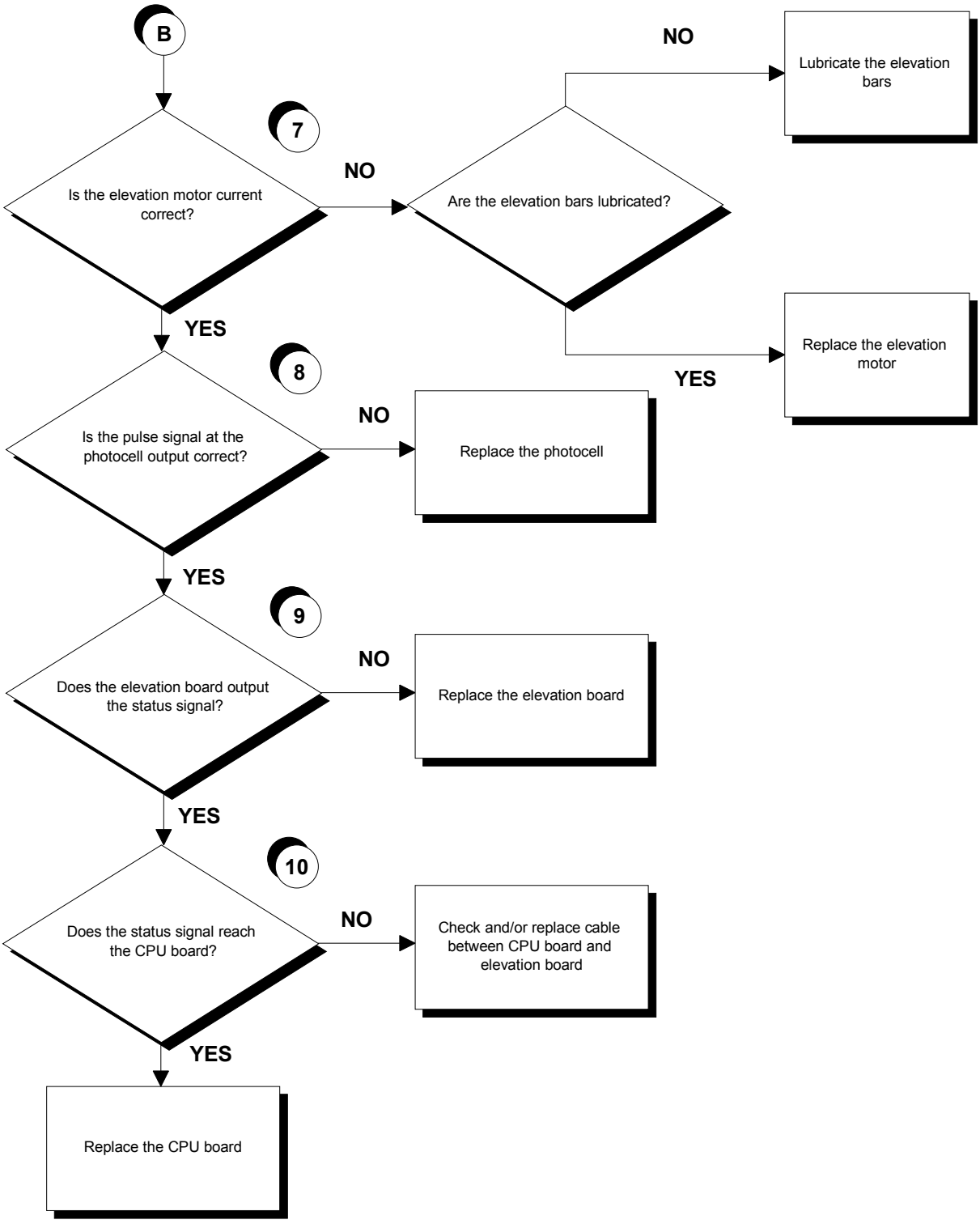


Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

If the motor momentarily starts and stops immediately afterward continuously, there is probably a problem with the photocell or its cable.

If you need to replace the elevation board, reassemble on the new board the chip installed into the old one, if it is a different version.

(1) Place the tester probes between pins 1 and 2 of connector CN3 on the elevation board. When the "↑" or "↓" key is pressed the measured value should be approximately 48 Vdc.

(2) Place the tester probes between pins 12 (ground) and 11 (signal) of connector CN1 on the CPU board. When the "↓" key is pressed the measured value should be approximately 4.2 Vdc. Place the tester probes between pins 12 (ground) and 10 (signal) of connector CN1 of the CPU board. When the "↑" key is pressed the measured voltage should be approximately 4.2 Vdc.

(3) Place the tester probes between pins 4 (ground) and 3 (signal) of connector CN2 on the elevation. board. When the "↓" key is pressed the measured voltage should be approximately 4.2 Vdc. Place the tester probes between pins 4 (ground) and 2 (signal) of connector CN2 on the elevation board. When the "↑" key is pressed the measured voltage should be approximately 4.2 Vdc.

(4) Place the tester probes between pins 1 and 2 of connector CN4 on the elevation board. The measured voltage should be approximately 220 VAC or 110 VAC depending on the type of mains electricity supply.

(5) Place the tester probes between pins 1 and 2 of connector CN6 on the elevation board. The measured voltage should be approximately 50 Vdc.

(6) Disconnect the yellow transformer cables on the rectifier bridge and place the tester probes across the 2 terminals. The measured voltage should be 38 VAC.

(7) Place the tester probes in series with the motor cable. When the "↑" or "↓" key is pressed the measured steady-state current should be less than 6 A.

(8) Slightly lift the connector on the photocell and place the scope probes between pins 4 (ground) and 2 (signal). When the motor moves, the tester should detect the pulses generated by the photocell.

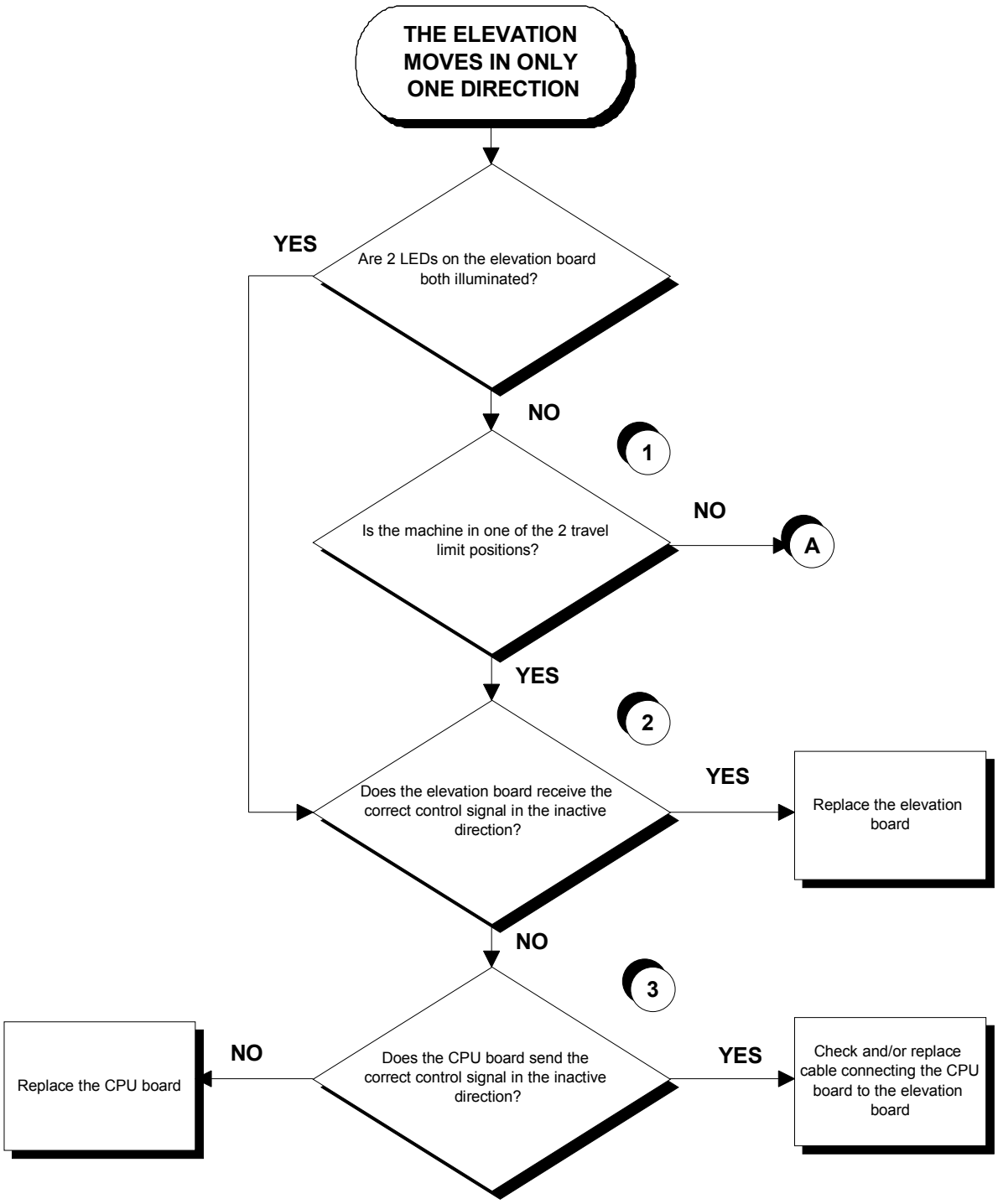
(9) Place the tester probes between pins 4 (ground) and 1 (signal) of connector CN2 on the elevation. board. When the motor moves, there should be a level changing for each 0.5% change in the machine elevation.

(10) As for step (11), but with the tester probes between pins 12 (ground) and 9 (signal) of connector CN1 on the CPU board.

6.9. THE ELEVATION MOVES IN ONLY ONE DIRECTION

The machine displays this error if a microswitch is broken or if it is unable to move the elevation motor.

Execute the following troubleshooting procedure when the machine does the reset at the start up described at paragraph 3.3.2. "The reset procedure".



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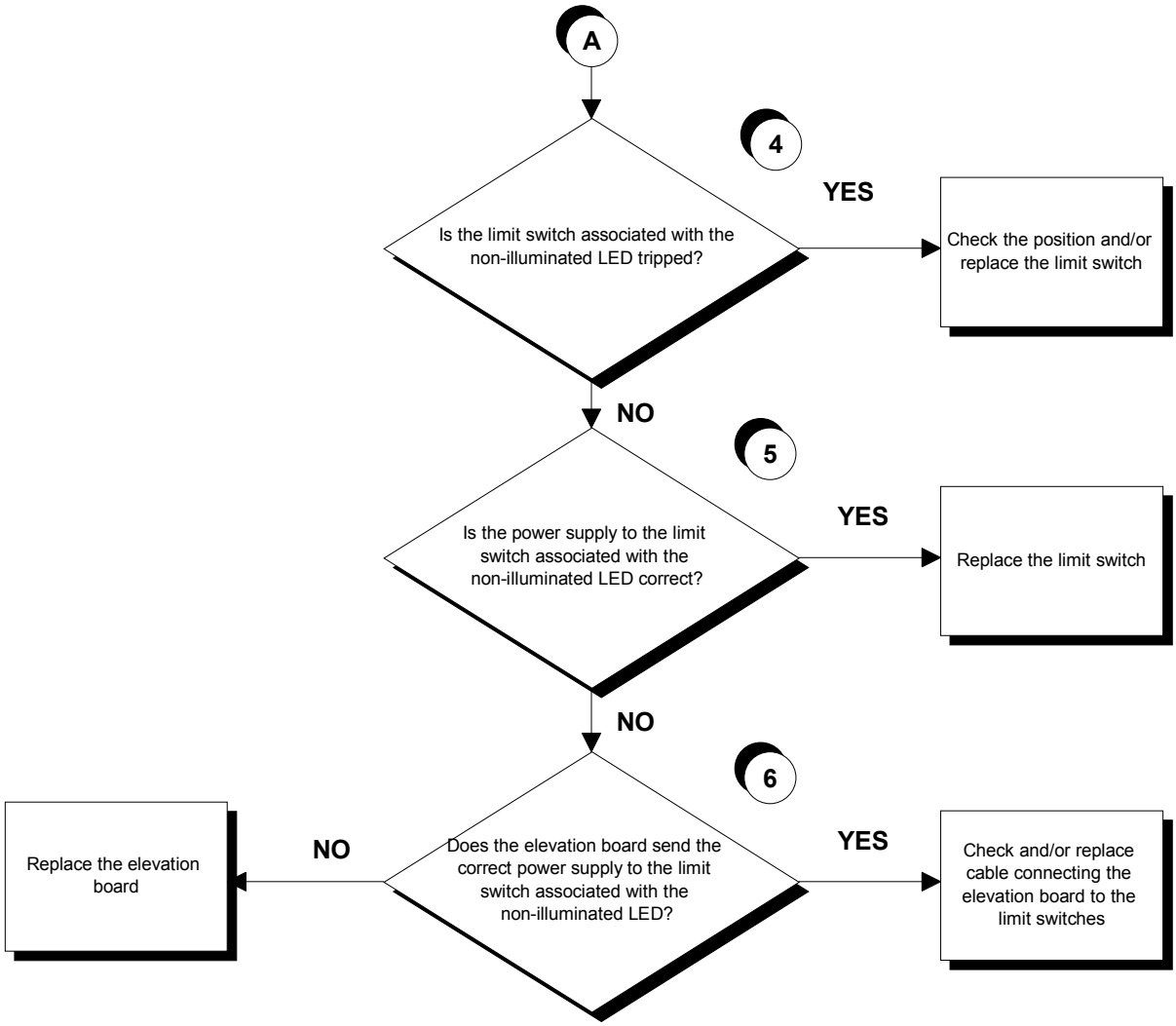


Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by circled numbers, which are described in detail below:

If you need to replace the elevation board, reassemble on the new board the chip installed into the old one, if it is a different version.

(1) The machine is considered to have reached a travel limit when the corresponding limit switch is tripped. The lower limit switch is tripped when its lever is pressed, while the upper limit switch is tripped when its lever is released.

(2) If the machine fails to move downward, place the tester probes between pins 4 (ground) and 3 (signal) of connector CN2 on the elevation board: the measured voltage should be approximately 4.2 Vdc. If the machine fails to move upward, place the tester probes between pins 4 (ground) and 2 (signal) of connector CN2 on the elevation board: the measured voltage should be approximately 4.2 Vdc.

(3) If the machine fails to move downward, place the tester probes between pins 12 (ground) and 11 (signal) of connector CN1 on the CPU board: the measured voltage should be approximately 4.2 Vdc. If the machine fails to move upward, place the tester probes between pins 12 (ground) and 10 (signal) of connector CN1 on the CPU board: the measured voltage should be approximately 4.2 Vdc.

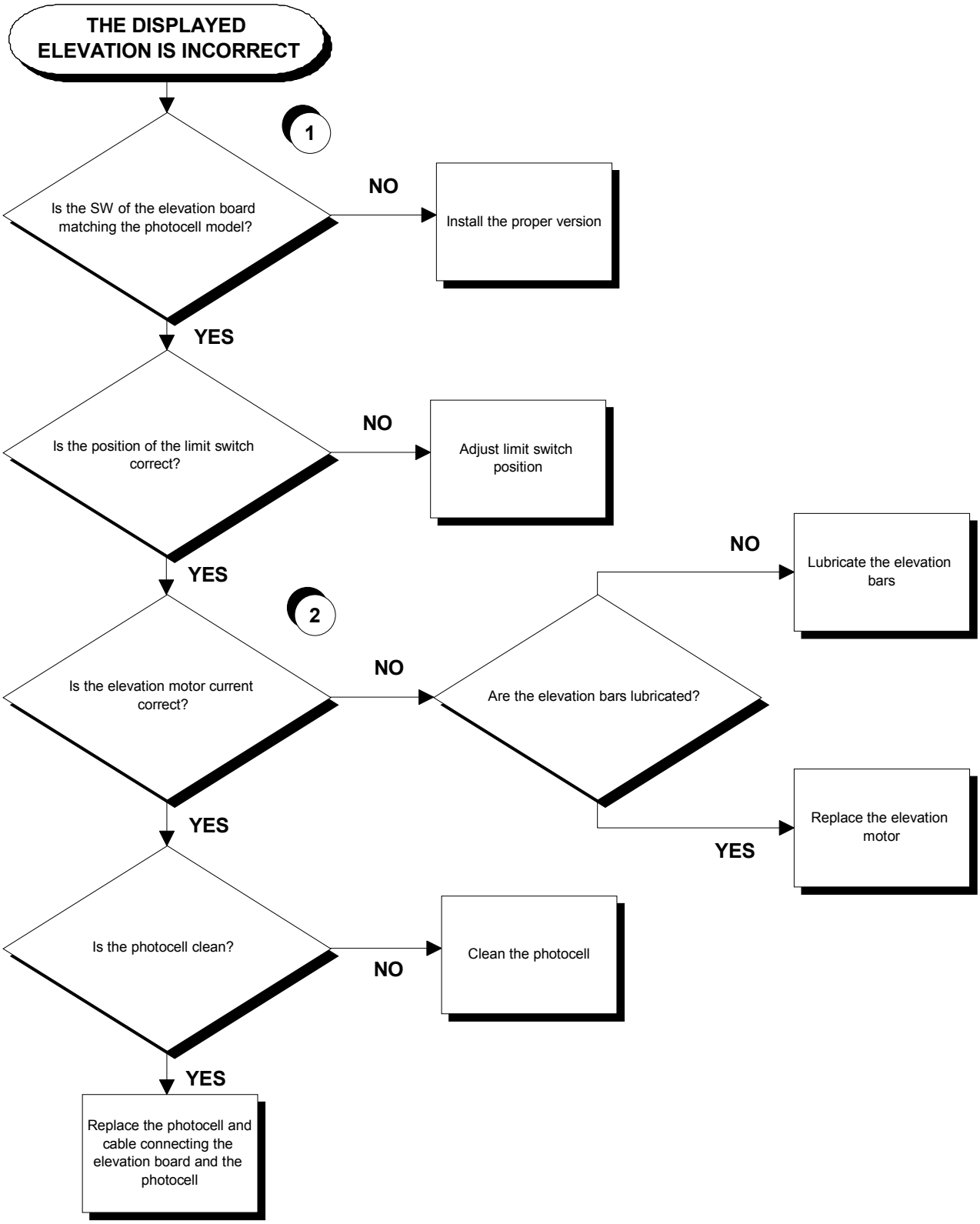
(4) DL1 corresponds to the upper limit switch, while DL2 on SMD board / DL3 on traditional board corresponds to the lower limit switch.

(5) Disconnect the 2 connecting cables of the relevant limit switch and place the tester probes across them: the measured voltage should be approximately 12 Vdc.

(6) To check the upper limit switch, place the tester probes between pins 6 (ground) and 3 (signal) of connector CN3 on the elevation board.: the measured voltage should be 12 Vdc. To check the lower limit switch, place the tester probes between pins 6 (ground) and 4 (signal) of connector CN3 on the elevation board: the measured voltage should be 12 Vdc.

6.10. THE DISPLAYED ELEVATION IS INCORRECT

The machine displays this error if there is a mismatch between the photocell model and the SW of the elevation board or there is a bad photocell reading due to incorrect calibration, breakage or disturbances produced by the motor brushes as a result of excessively high currents.



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) See the following table:

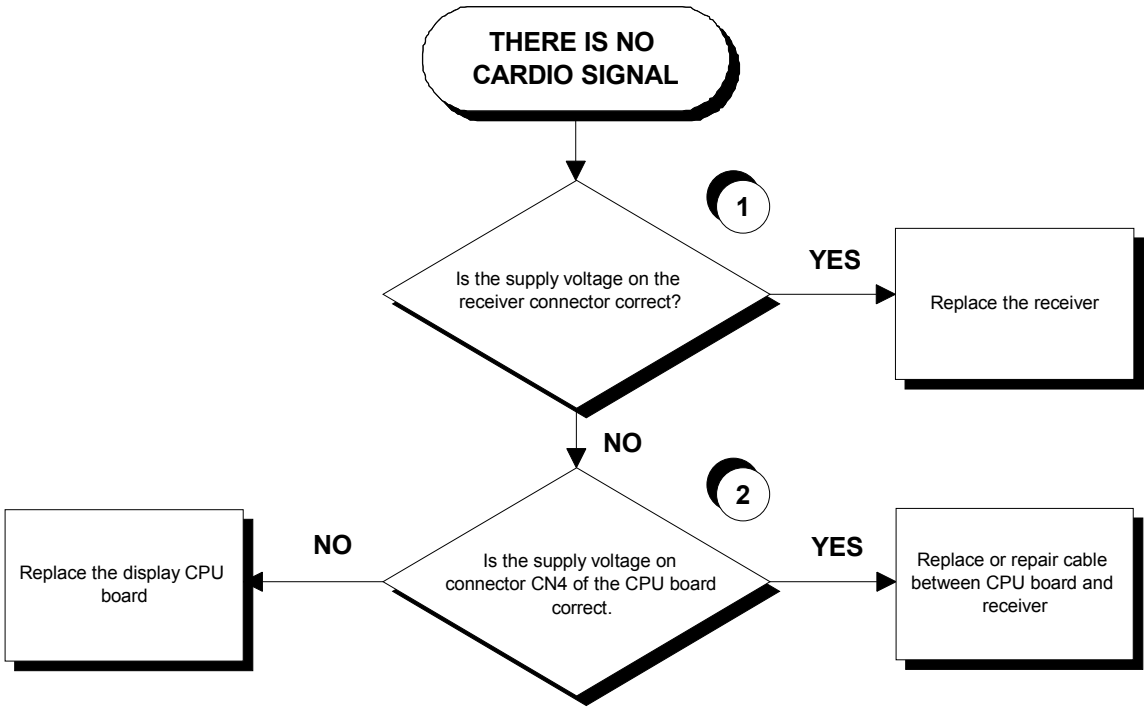
Photocell	Photocell board	SW
Optek OPB610	GF970711	RX50V1

(2) Place the tester probes in series with the motor cable. When the "↑" or "↓" keys are pressed the measured steady-state current should be less than 6 A.

6.11. THERE IS NO HEART RATE SIGNAL

6.11.1. TELEMETRIC RECEIVER

The machine displays this error if the receiver is not functioning, or if it fails to receive the power supply from the CPU board.



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:

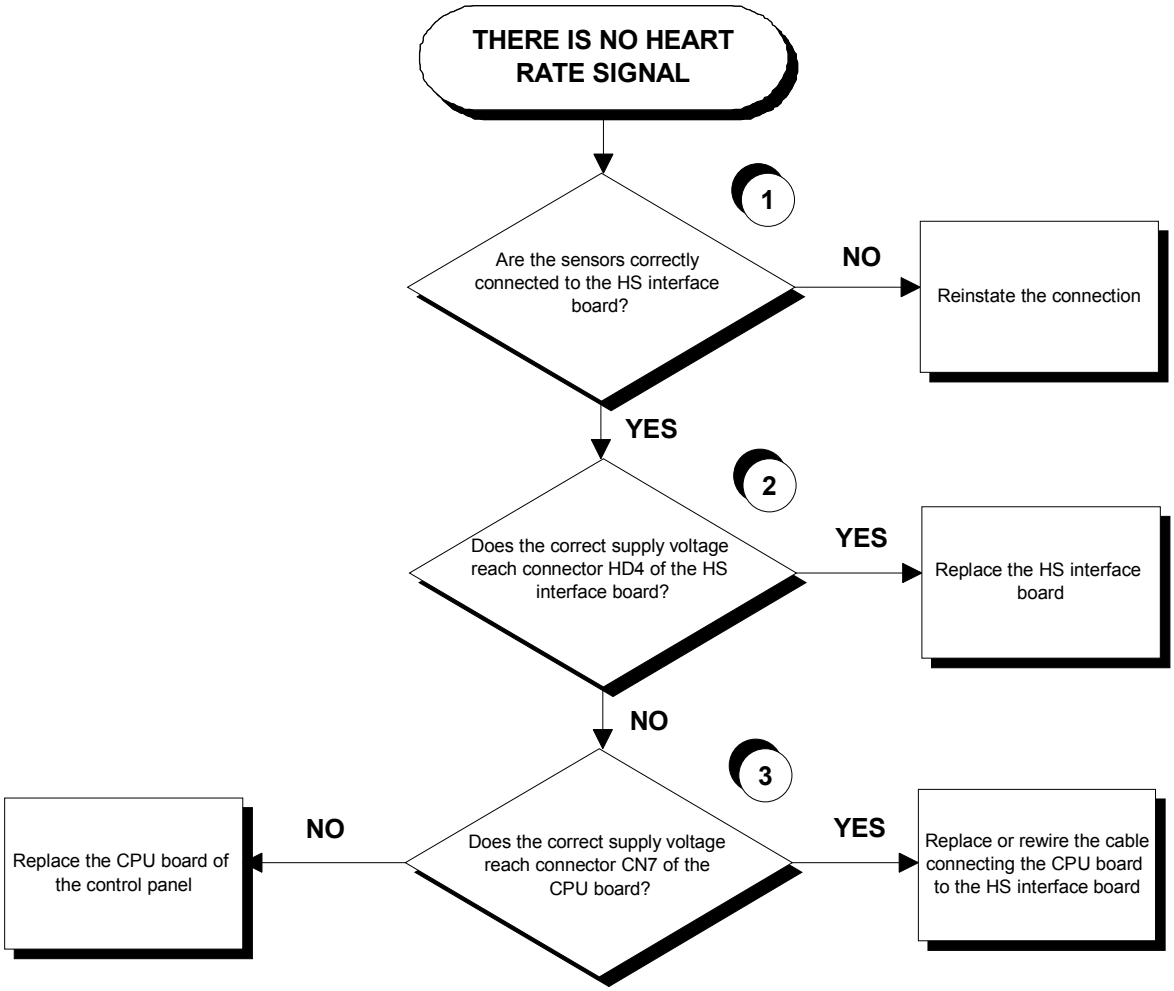
(1) Place the tester probes between pins 1 and 3 (corresponding to the red and black wires) of the 4-pin cardio receiver connector: the voltage should be +5 Vdc.

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

6.11.2. HAND SENSOR

The machine displays this error if the HS interface board is not functioning, or if it fails to receive the power supply from the CPU board.

ATTENTION: check that the use of the hand sensors is enabled as described in chapter 9.2. "Technical setting parameters".



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:

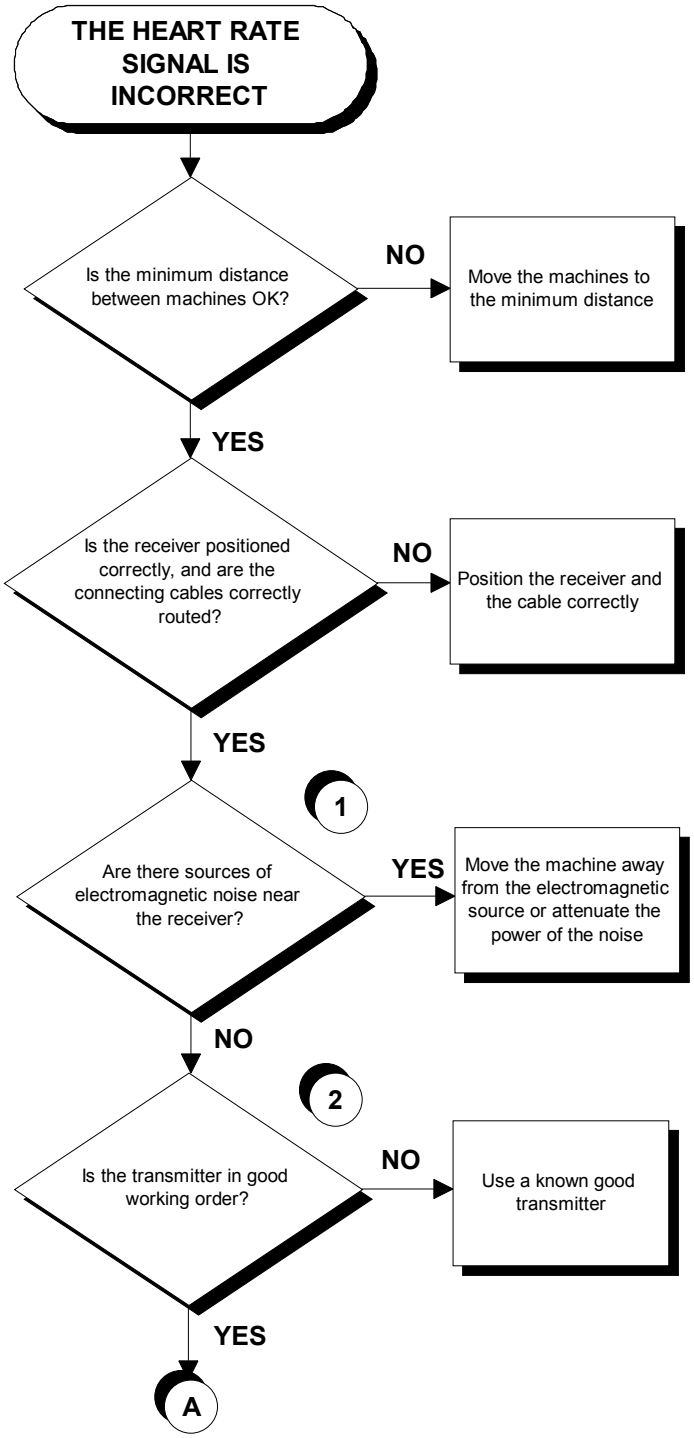
(1) Check the connections, referring to paragraph 2.5. “Wiring diagram for the 220 model with non-coded receiver”.

(2) Place the tester probes between pins 2 and 1 of connector HD4 on the HS interface board: the measured voltage should be +5 Vdc.

(3) Place the tester probes between pins 4 and 2 of connector CN7 on the CPU board: the measured voltage should be +5 Vdc.

6.12. THE TELEMETRIC HEART RATE SIGNAL IS INCORRECT

The machine generates this error if the receiver is disturbed by electromagnetic noise in the surrounding environment.



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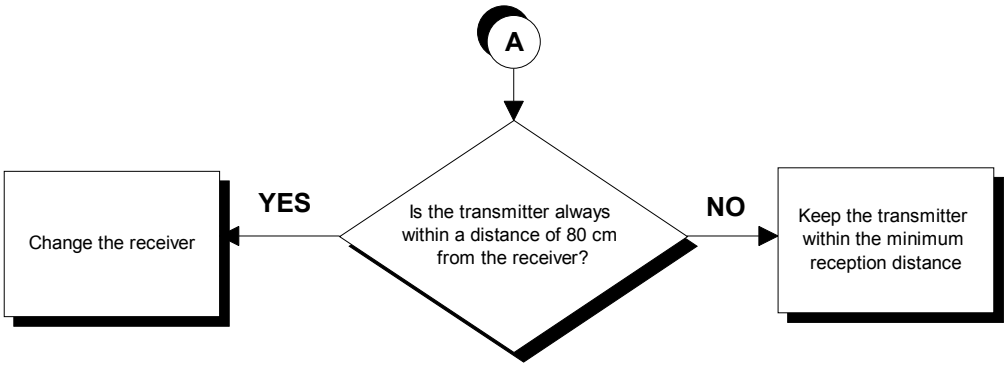
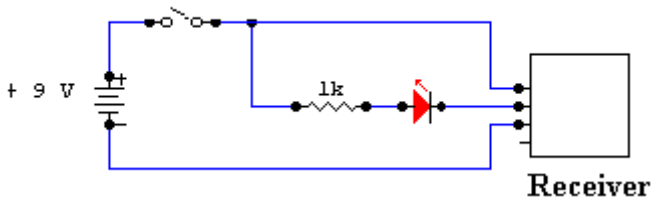


Follow the procedure step by step to correctly diagnose the problem. Take particular care with the checks highlighted by the circled numbers, which are described in detail below:

(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

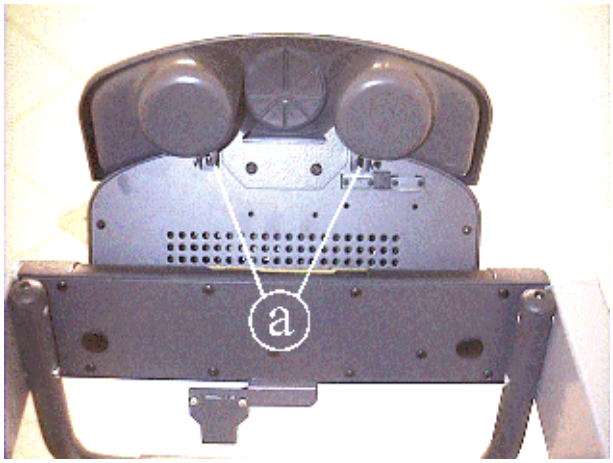

Figure 7.1-1

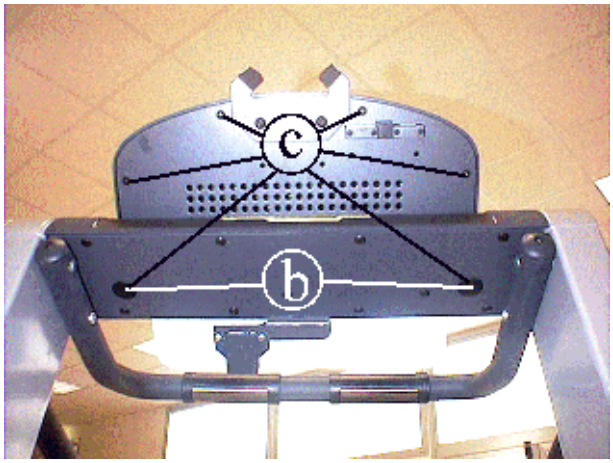

Figure 7.1-2

1. Turn off the machine and unplug the mains lead from the wall output.
2. Unscrew the 2 screws **a** using a large Phillips screwdriver.
3. Remove the tidy rack.
4. Remove the 2 caps **b**.
5. Unscrew the 6 screws **c**, using a large Phillips screwdriver.

Support the DISPLAY before removing the last screw.

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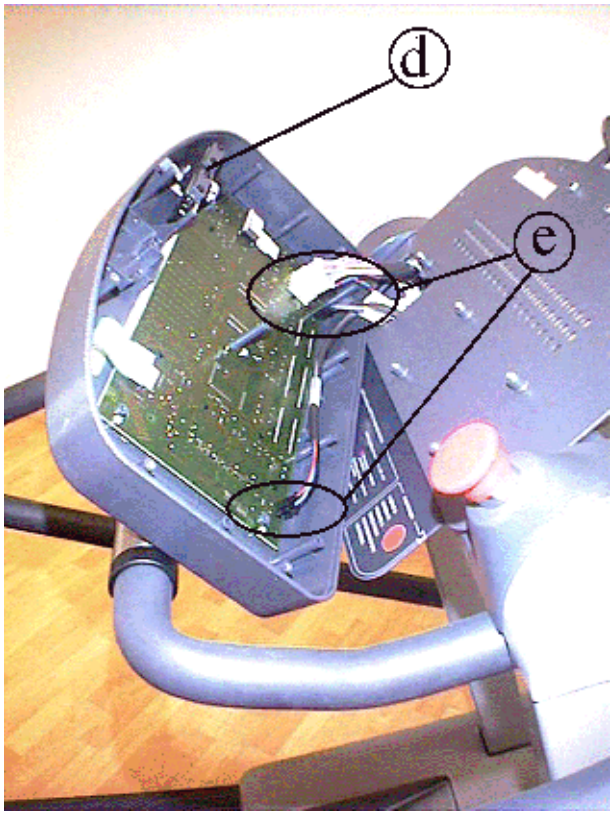

Figure 7.1-3

6. Open the DISPLAY taking care to the RJ45-RS232 board **d**.

To remove the DISPLAY:

7. Disconnect connectors **e**.
8. Remove the DISPLAY.

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

7.2. DISASSEMBLING THE EPROM

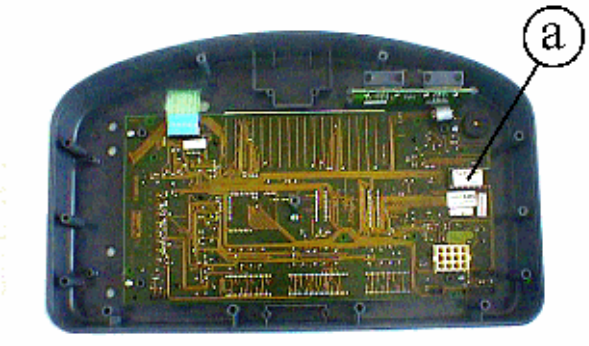

Figure 7.2-1

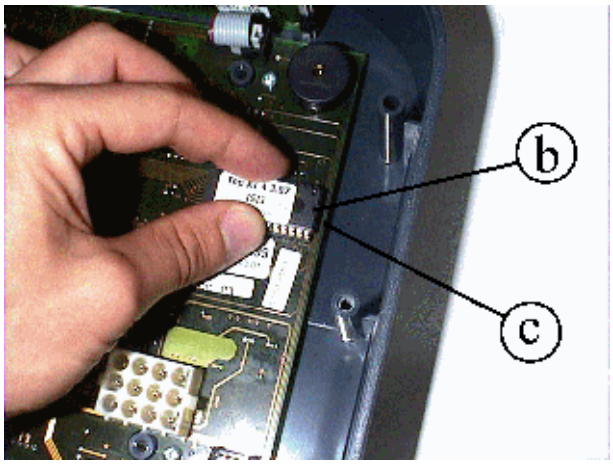

Figure 7.2-2

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 index **b** on the EPROM coincides with reference notch **c** on the socket.
2. Be careful to center the EPROM pins above their corresponding holes in the socket.
3. Push the pins into the socket.

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

7.3. DISASSEMBLING THE CPU BOARD

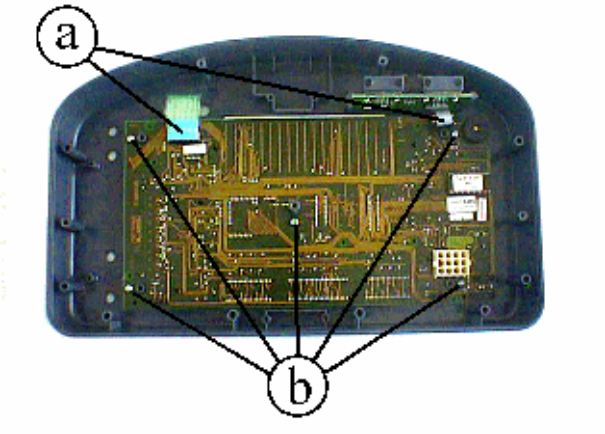

Figure 7.3-1

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

With the display placed on a work bench:

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

These procedures 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

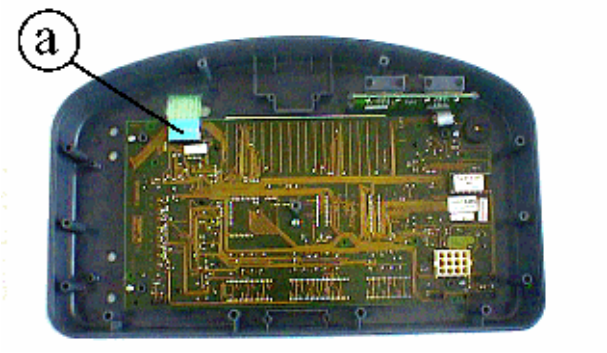

Figure 7.4-1

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

1. Disconnect KEYBOARD connector **a**.

With the display placed on a work bench:

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

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

1. Remove the backing film which protects the adhesive.
2. Apply the adhesive part, starting from the left and working towards the right, without bending 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.

Figure 7.4-2

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 housed inside the display.

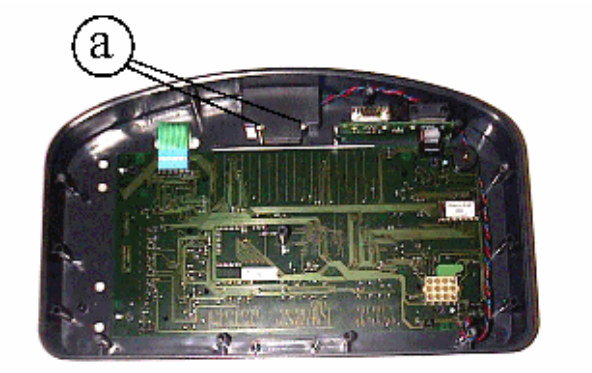

Figure 7.5-1

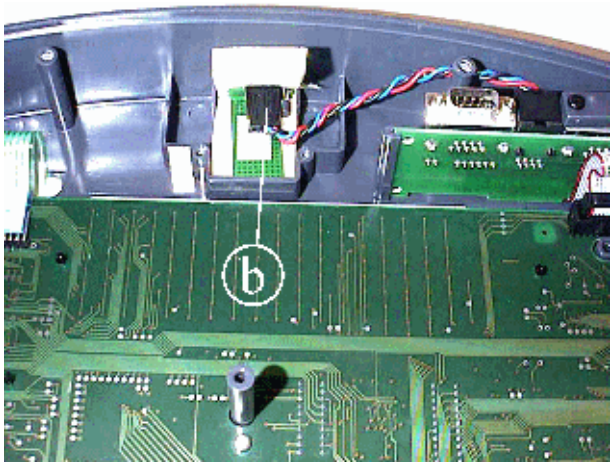

Figure 7.5-2

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

With the display on a work bench:

1. Unscrew the 2 screws **a** using a small Phillips screwdriver.
2. Open the cover.

3. Disconnect connector **b**.
4. Remove the RECEIVER.

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

Version B: receiver positioned under the display.

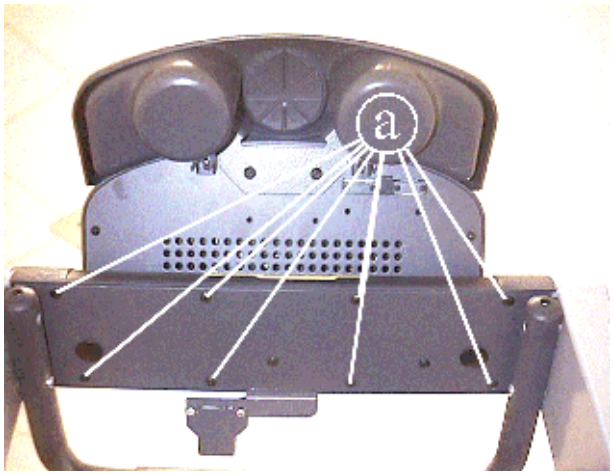

Figure 7.5-3

1. Turn off the machine and unplug the mains lead from the wall output.
2. Unscrew the 8 screws **a** using a large Phillips screwdriver.
3. Rotate the display group through 180°.

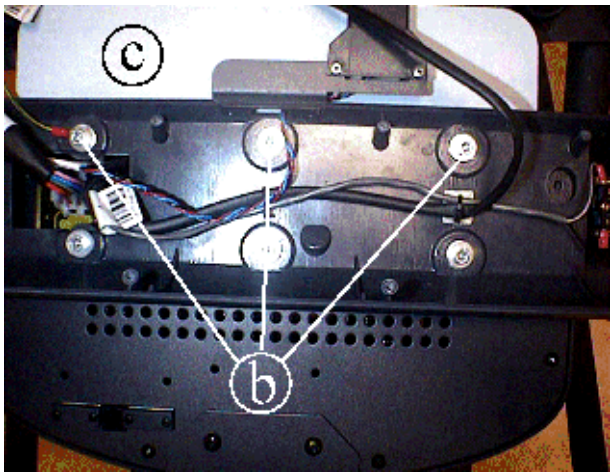

Figure 7.5-4

4. Back off the 3 screws **b** using a 5-mm hex T wrench.
5. Remove the lexan instruction panel **c**.
6. Rotate the display group back through 180°.

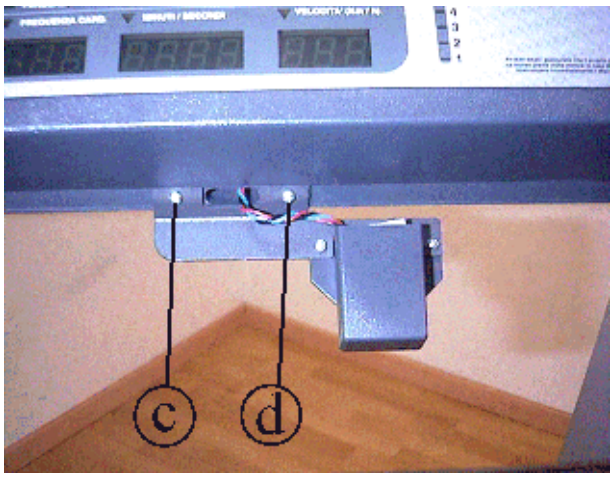

Figure 7.5-5

7. Undo screw **c** using a medium phillips screwdriver.
8. Back off screw **d** using a medium phillips screwdriver.

Continued on the following page →

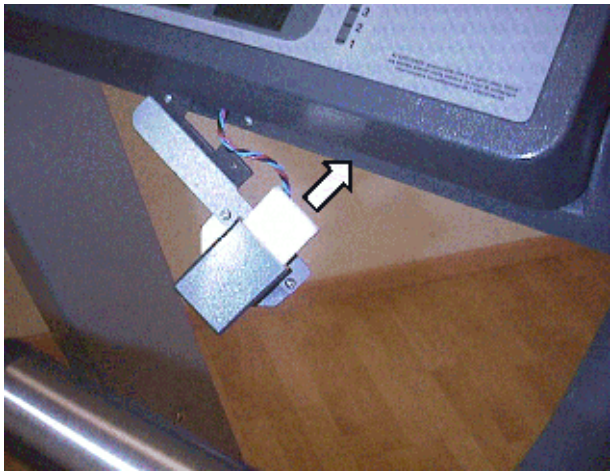

Figure 7.5-6

9. Rotate the RECEIVER support.
10. Remove the RECEIVER by pulling it from the top.

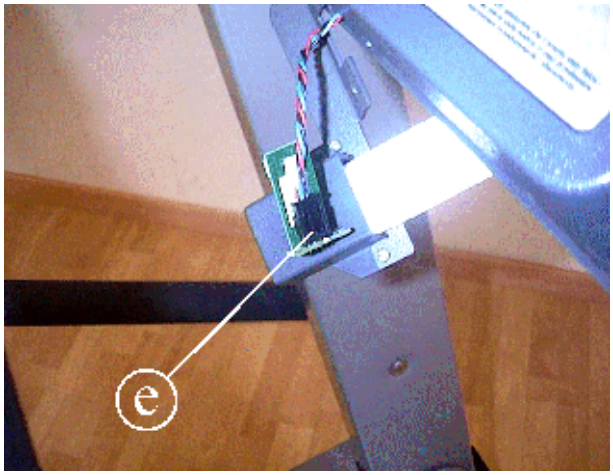

Figure 7.5-7

11. Disconnect connector **e**.
12. Remove the RECEIVER.

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

WARNING: route the cables as described in paragraph 11.1. "Technical notes on cardio receivers".

7.6. DISASSEMBLING THE EMERGENCY BUTTON

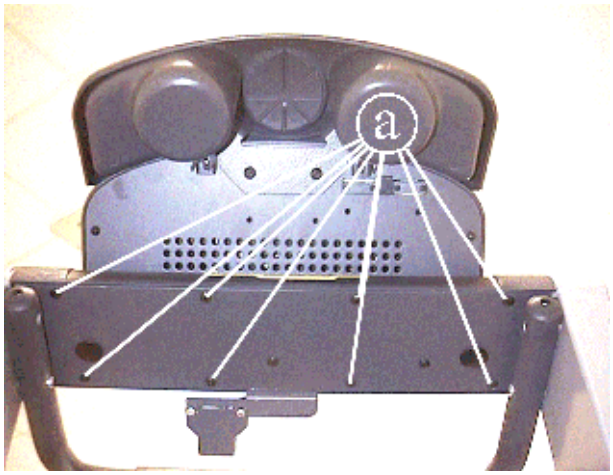

Figure 7.6-1

1. Turn off the machine and unplug the mains lead from the wall outlet.
2. Unscrew the 8 self-tapping screws **a** using a large Phillips screwdriver.

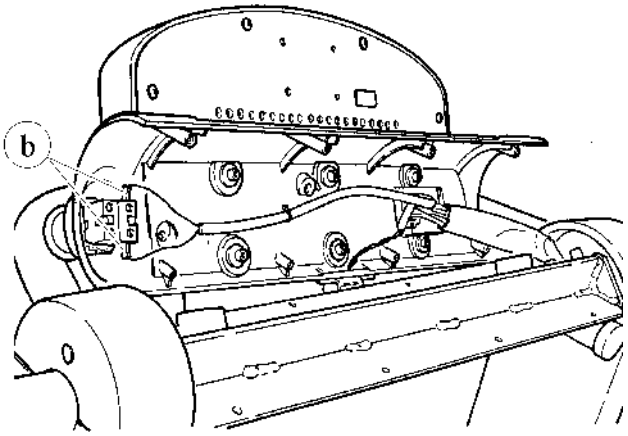

Figure 7.6-2

3. Open the display panel support.
4. Disconnect the two EMERGENCY BUTTON wires **b**, using a large Phillips screwdriver.

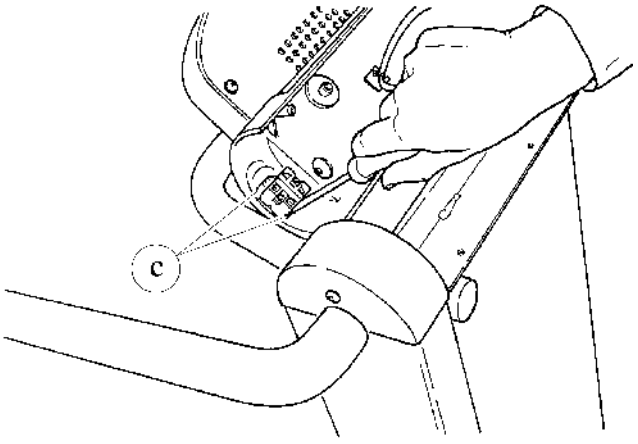

Figure 7.6-3

5. Back off the 2 screws **c** which fix the EMERGENCY BUTTON to the panel using a large Phillips screwdriver.

Continued on the following page→

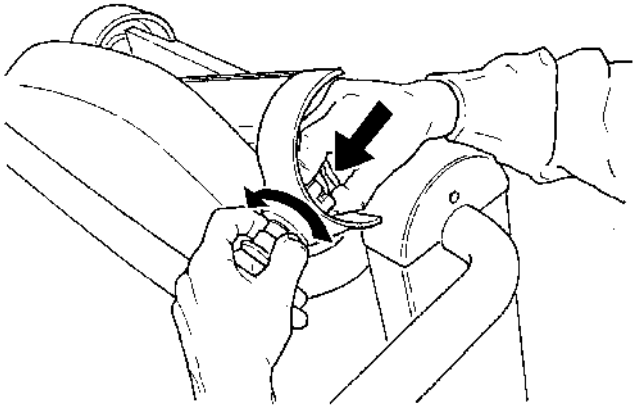

Figure 7.6-4

6. Firmly gripping the inner part, push and rotate the EMERGENCY BUTTON to detach it.

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

7.7. DISASSEMBLING THE HS INTERFACE BOARD

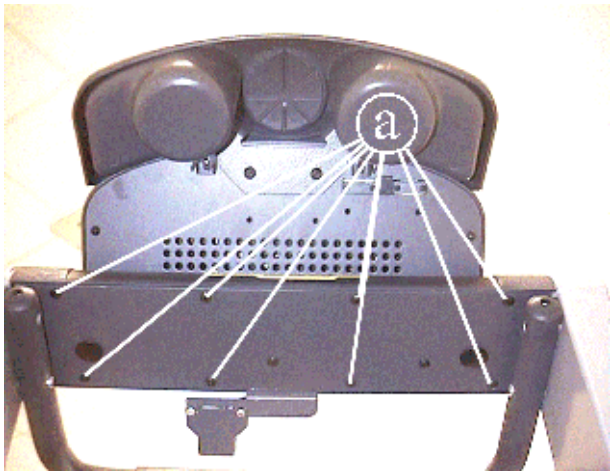

Figure 7.7-1

1. Turn off the machine and unplug the mains lead from the wall output.
2. Back off the 8 screws **a** using a large Phillips screwdriver.

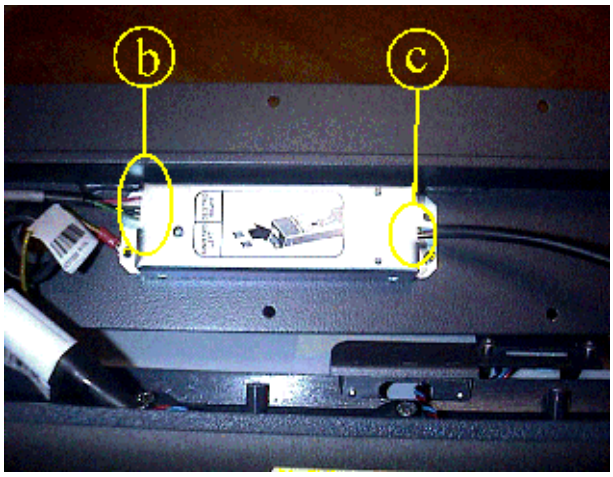

Figure 7.7-2

3. Disconnect connectors **b**.
4. Disconnect connector **c**.

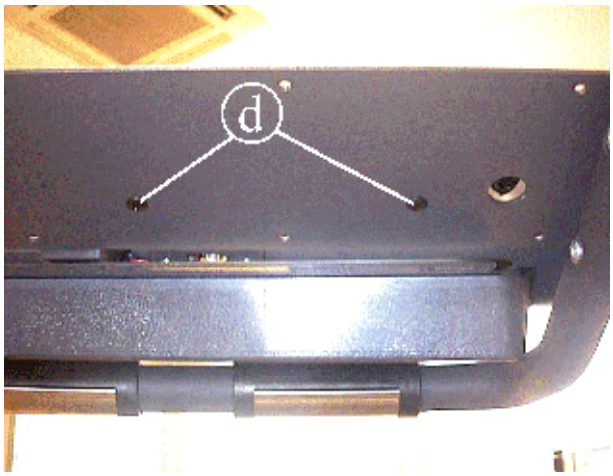

Figure 7.7-3

5. Back off the 2 screws **d** using a large Phillips screwdriver.
6. Remove the HS INTERFACE BOARD.
7. To separate the circuit board from its support, open the 4 fixing clips.

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

The cable which goes from the CPU board to the HS interface board must be plugged into the lowermost connector of the HS interface board (looking at the display from the exercise position).

7.8. DISASSEMBLING THE HAND SENSORS

Figure 7.8-1

Figure 7.8-2

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

For each SENSOR:

2. Use a pointed tool (such as a screwdriver) to leverage inside the SENSOR slot **a**.
3. Lift the upper SENSOR.

The sensors are attached to the handlebar with adhesive tape.

4. Back off the 2 screws **b** using a small Phillips screwdriver.
5. Allow the lower SENSOR to drop.

6. To disconnect the SENSORS, disconnect the Fastons of their fixing cables.

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

7.9. DISASSEMBLING THE MOTOR GUARD

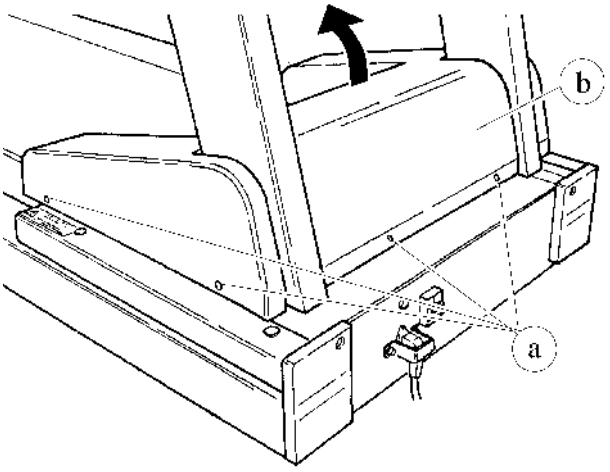

Figure 7.9-1

1. Turn off the machine and unplug the mains lead from the wall outlet.
2. Unscrew the 6 screws **a** using a large Phillips screwdriver.
3. Remove the MOTOR GUARD **b**.

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

7.10. DISASSEMBLING THE FRONT PLATE

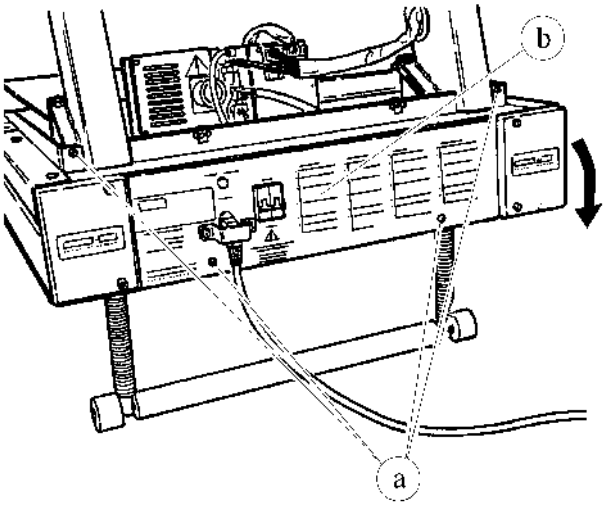

Figure 7.10-1

Carry out the procedure described in paragraph 7.9. "Disassembling the motor guard".

1. Unscrew the 4 self-tapping screws **a** using a large Phillips screwdriver.

2. Rotate the FRONT PLATE **b** downward.

The plate remains connected to the frame by two steel cables.

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

7.11. DISASSEMBLING THE RUNNING TRACK

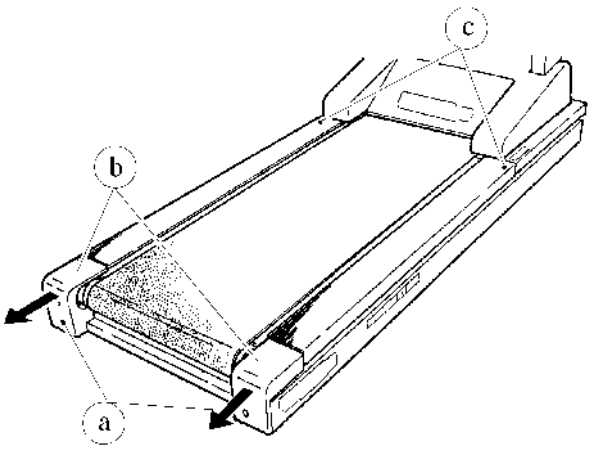

Figure 7.11-1

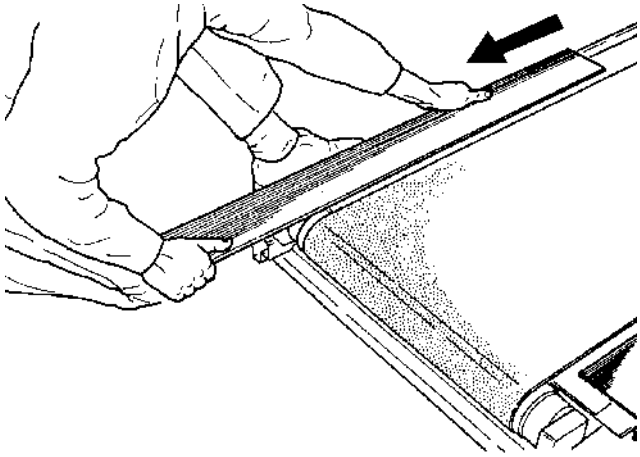

Figure 7.11-2

1. Turn off the machine and unplug the mains lead from the wall outlet.
2. Unscrew the 2 screws **a** using a 6-mm Allen T wrench.
3. Remove the rear caps **b** on the right and left hand sides.
4. Unscrew the 2 screws **c** fixing the footrests using a 5-mm Allen T wrench.
5. Remove the footrests by pulling them toward the back of the machine.

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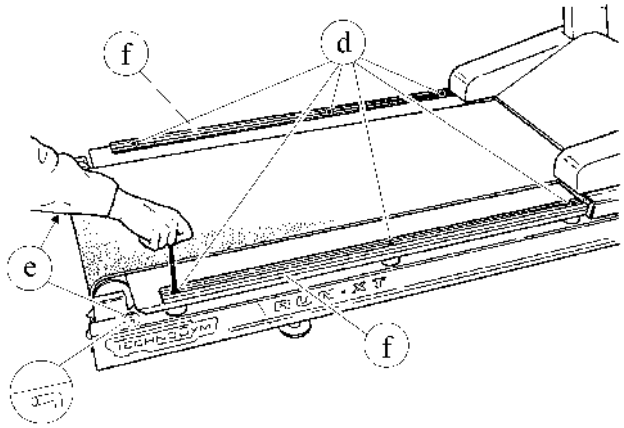

Figure 7.11-3

6. Unscrew the 6 screws **d** using:
   - the 2 rear a 5-mm Allen T wrench;
   - the 4 front screws using a 5-mm Allen T wrench while holding the nut in place with a 13-mm wrench.
7. Remove the 2 footrest guides **f**.
8. Pull out the RUNNING TRACK from the side.

The front and rear profiles of the RUNNING TRACK are different, and therefore it is necessary to mark the correct positions in order to avoid errors during the reassembly phase.

Before reassembling the caps, check that the fixing bolts are in the position indicated in the figure.

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

7.12. DISASSEMBLING THE DRIVEN ROLLER, THE DRIVING ROLLER, THE TREAD BELT AND THE MOTOR BELT

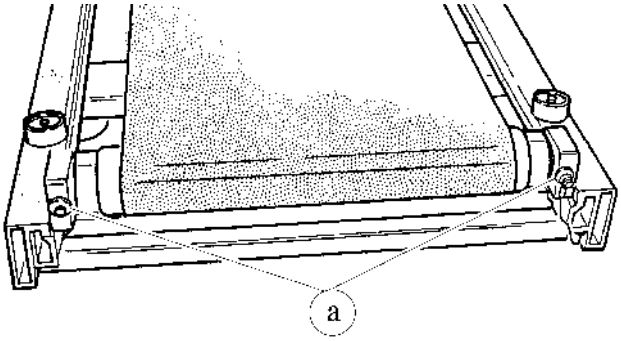

Figure 7.12-1

1. Place the machine in the maximum elevation position.
2. Carry out the procedure described in paragraphs 7.9. “Disassembling the motor guard” and 7.11. “Disassembling the running track”.

3. Remove the dust guard.

4. Unscrew the 2 screws **a** using a 6-mm Allen T wrench.

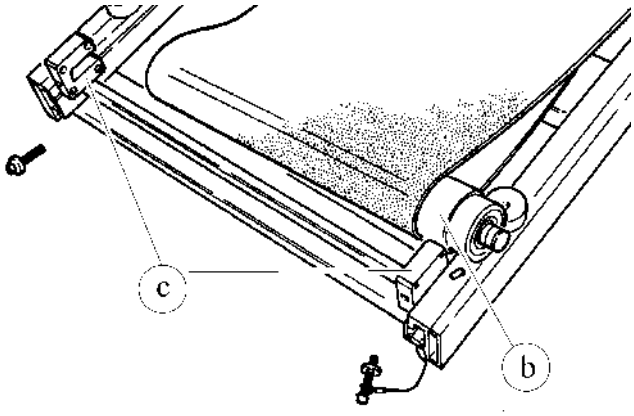

Figure 7.12-2

5. Pull out the DRIVEN ROLLER **b** from its supports **c**.
6. Remove the DRIVEN ROLLER.

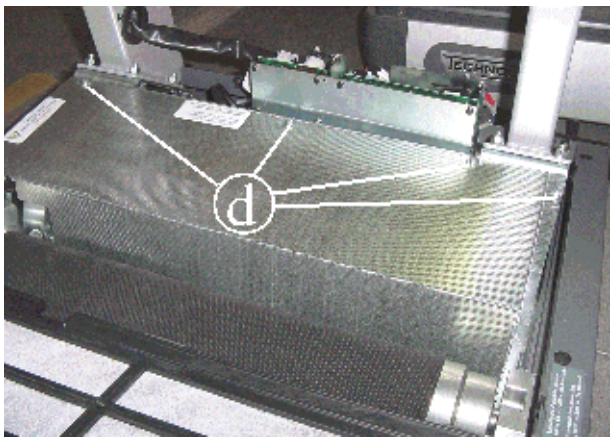

Figure 7.12-3

7. Remove the grid that shield the motor and inverter area, backing off the 4 screws **d** using a 4-mm Allen T wrench.

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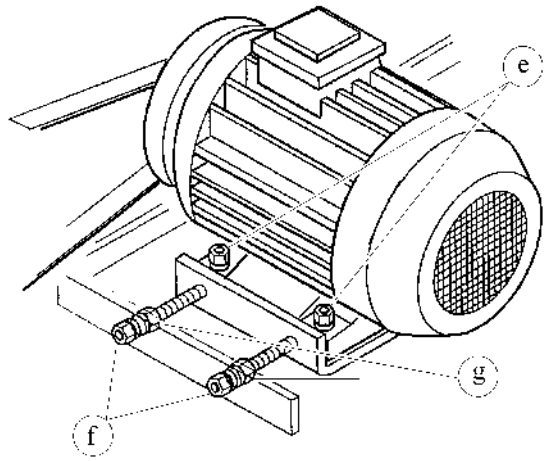

Figure 7.12-4

8. Back off the 4 nuts **d** (2 are concealed by the motor in the figure at left) which fix the belt motor to the machine frame using a 13-mm wrench, and holding the screw underneath in place with a 6-mm Allen T wrench.
9. Back off the 2 outer nuts **e** and the 2 inner nuts **f** using a 13-mm wrench.

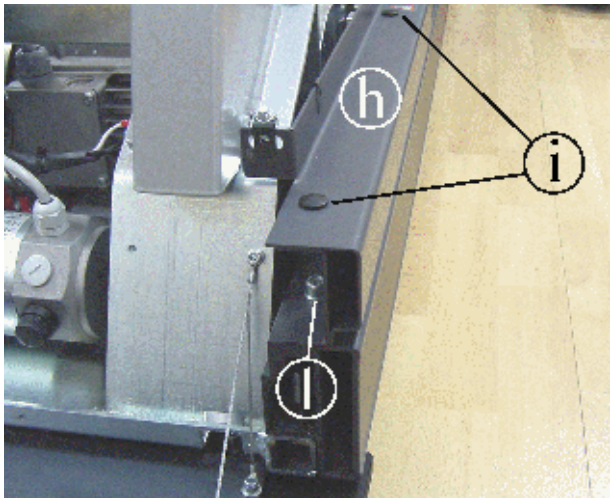

Figure 7.12-5

10. Remove the 2 caps **h**.
11. Back off the 2 bolts **i** using a 6-mm allen wrench through the holes previously closed by the caps **h**.
12. Remove the plate **g**.

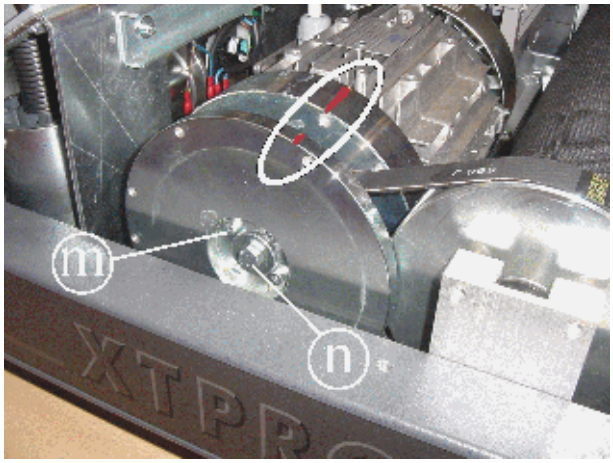

Figure 7.12-6

13. Using a felt-tip pen, mark the top part of both flywheels as shown in the figure.
14. Disassemble the outer flywheel by backing off the four screws **l** using a 4-mm Allen wrench and the bolt **m** using a 13-mm wrench.

Continued on the following page →

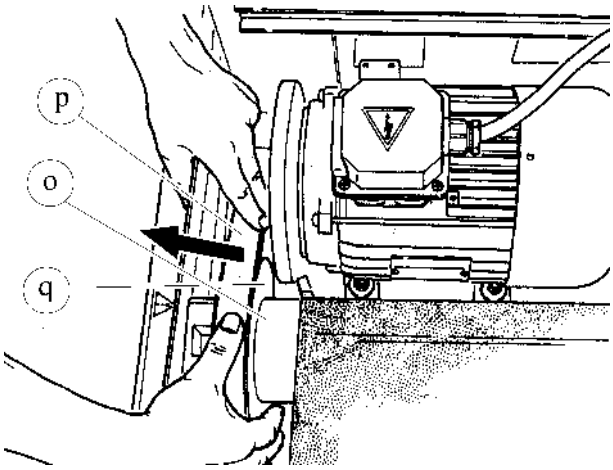

Figure 7.12-7

15. Move the belt motor toward the DRIVING ROLLER **n** and pull outward to remove belt **o** from the motor pulley **p.**

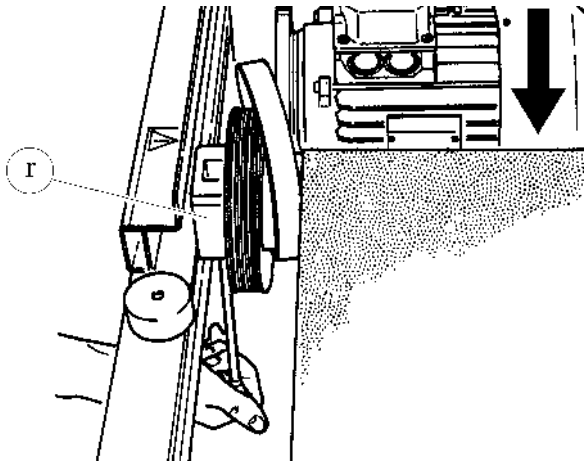

Figure 7.12-8

16. Unscrew the 2 fixing screws of the DRIVING ROLLER **q** using a 6-mm Allen T wrench.

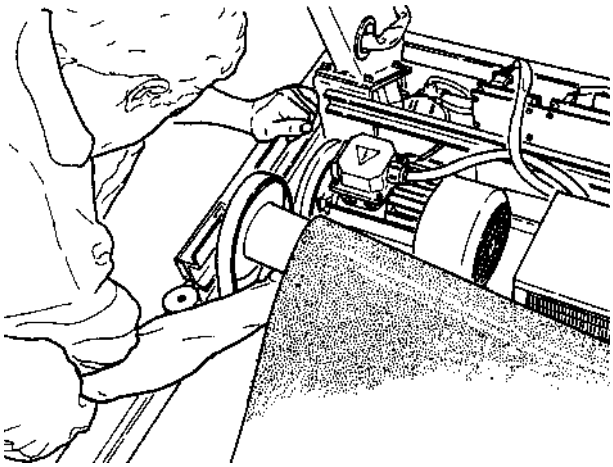

Figure 7.12-9

17. Disengage the DRIVING ROLLER from its supports.
18. Remove the MOTOR BELT by pulling it out from the DRIVING ROLLER.
19. Remove the DRIVING ROLLER.
20. Remove the TREAD BELT.

Continued on the following page →

To reassemble the DRIVEN ROLLER, the DRIVING ROLLER, the TREAD BELT and the MOTOR BELT, carry out the above steps in reverse order.

To reassemble the flywheels the right way round, use the markings made previously.

To ensure correct reassembly, insert the DRIVING ROLLER in the MOTOR BELT before assembling it on the supports.

After completing this procedure, adjust the tension and centering of the TREAD BELT as described in paragraphs 8.1. 8.2. 8.3. and adjust the tension and alignment of the MOTOR BELT as described in paragraph 8.4.

7.13. DISASSEMBLING THE BELT MOTOR

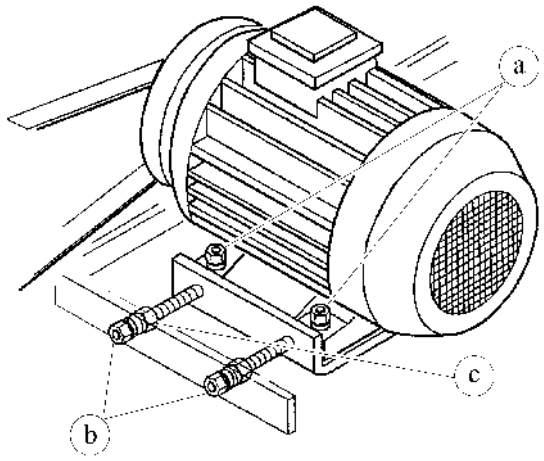

Figure 7.13-1

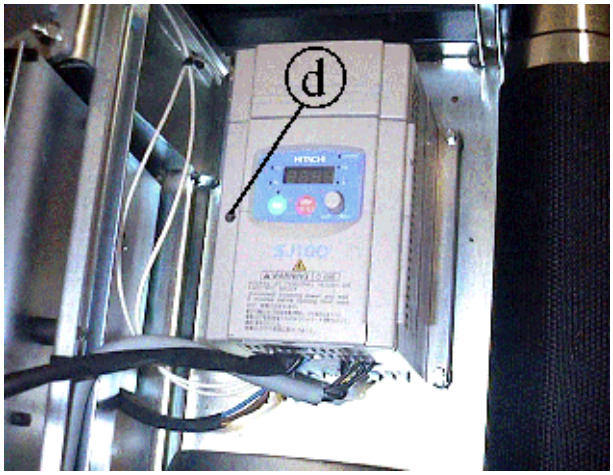

Figure 7.13-2

Carry out the procedure described in paragraph 7.9. "Disassembling the motor guard".

1. Remove the dust guard.

2. Unscrew the 4 nuts **a** (2 are concealed by the motor in the figure at left) which fix the belt motor to the machine frame using a 13-mm wrench and holding the screw underneath in place with a 6-mm Allen T wrench.
3. Back off the 2 outer nuts **b** and the 2 inner nuts **c** using a 13-mm wrench.
4. Move the BELT MOTOR toward the driving roller.
5. Disengage the motor belt.

The motor cable is directly connected to the TREAD BELT MOTOR and must therefore be disconnected from the inverter.

6. Unscrew the screw **d** using a small Phillips screwdriver.
7. Remove the cover.

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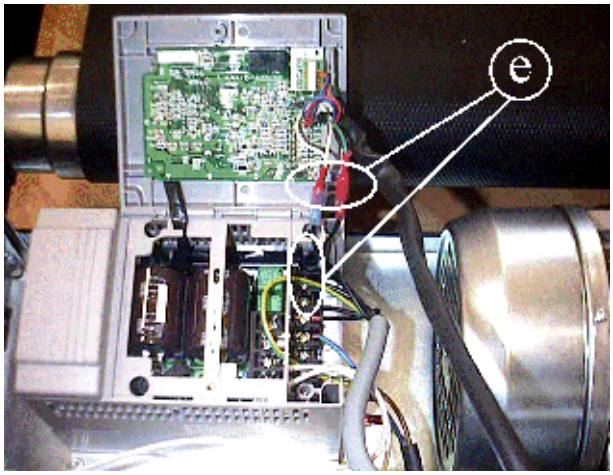

Figure 7.13-3

8. Disconnect connectors **e**.
9. Remove the BELT MOTOR.

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

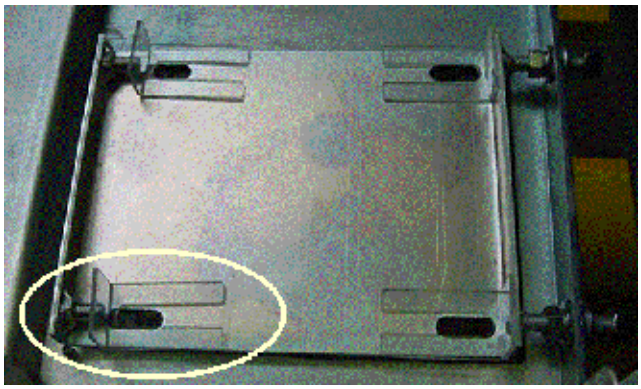

Figure 7.13-4

Remember to reassemble the motor on the plastic support shown in the figure at left, that insulate it from the frame.

After completing the procedure, adjust the tension and alignment of the MOTOR BELT as described in paragraph 8.4. .

7.14. DISASSEMBLING THE ELECTRONIC CIRCUIT BOARDS

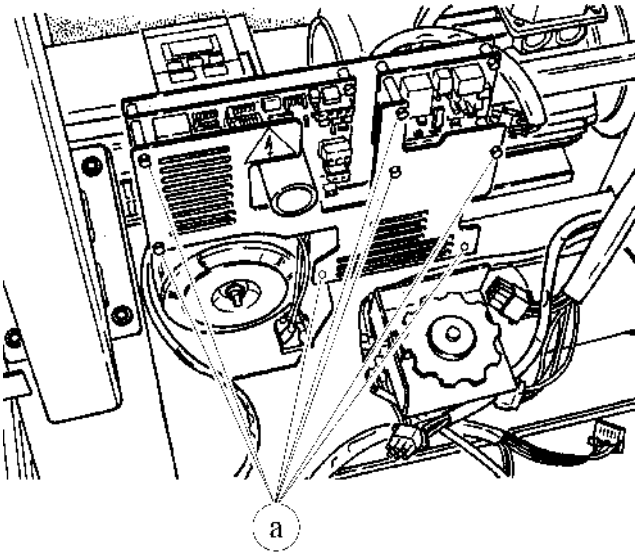

Figure 7.14-1

Carry out the procedures described in paragraphs 7.9. "Disassembling the motor guard" and 7.10. "Disassembling the front plate".

1. Cut any straps fixing the cables to the grille protecting the ELECTRONIC CIRCUIT BOARDS.
2. Unscrew the 7 plastic hexagonal-head screws **a** which secure the protective grille using a 7-mm wrench.
3. Remove the protective grille.

To disassemble an ELECTRONIC CIRCUIT BOARD:

4. Disconnect all the connectors.
5. Unscrew the screws fixing it to the plate support using a 7-mm socket wrench.
6. Manually unscrew the fixing studs of the protective grille.
7. Remove the ELECTRONIC CIRCUIT BOARD.

To remove the elevation board it is sufficient to disconnect the red and black cables; the yellow cables pertain to the transformer.

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

After reassembling the inverter interface board, calibrate the speed as instructed in paragraph 8.7. .

7.15. DISASSEMBLING THE INVERTER

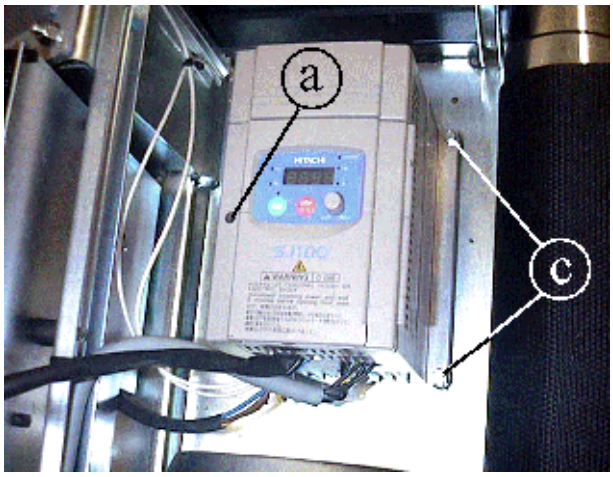

Figure 7.15-1

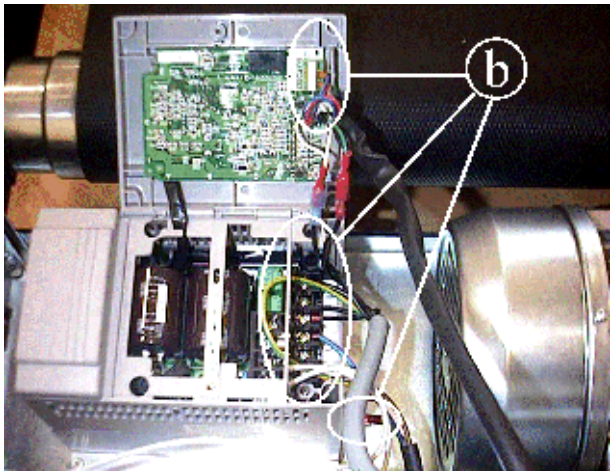

Figure 7.15-2

Carry out the procedure described in paragraph 7.9. "Disassembling the motor guard".

1. Unscrew the screw **d** using a small Phillips screwdriver.
2. Remove the INVERTER cover.

3. Disconnect the electrical cables **b**.

4. Unscrew the 4 fixing screws **c** (shown in Figure 7.15-1) using an 8-mm wrench holding the nut underneath in place with an 8-mm wrench.
5. Remove the INVERTER.

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

After completing this procedure, calibrate the speed as instructed in paragraph 8.7. .

7.16. DISASSEMBLING THE ELEVATION MOTOR BELT

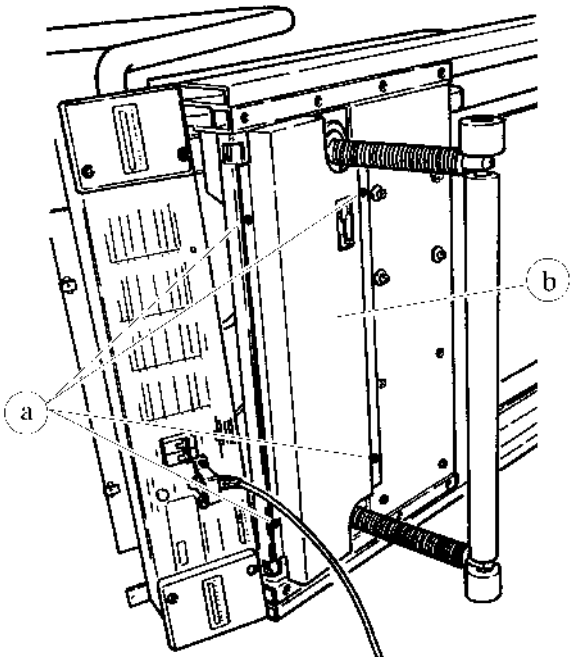

Figure 7.16-1

1. Set the elevation at 7%.

Carry out the procedures described in paragraphs 7.9. “Disassembling the motor guard” and 7.10. “Disassembling the front plate”.

2. Overturn the machine on the right hand side.

3. Using a large Phillips screwdriver, unscrew the 4 self-tapping screws **a**.
4. Remove the belt guard **b**.

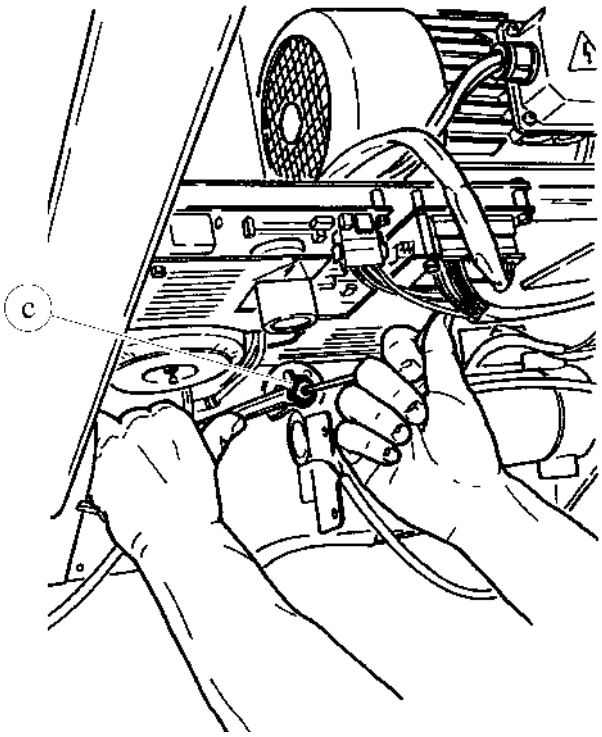

Figure 7.16-2

5. Holding the pivot in place with a 5-mm Allen T wrench, back off the self-tapping nut of belt tensioner **c** using a 17-mm wrench.
6. Rotate the belt tensioner to slacken the BELT.
7. Remove the BELT.

When removing the BELT, be careful not to rotate the lead screw nuts.

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

After completing this procedure, adjust the tension of the ELEVATION MOTOR BELT as instructed in paragraph 8.5. .

7.17. DISASSEMBLING THE ELEVATION MOTOR

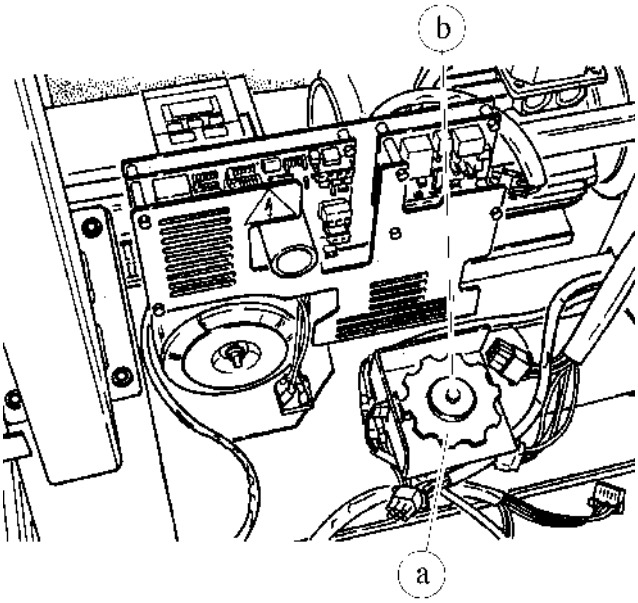

Figure 7.17-1

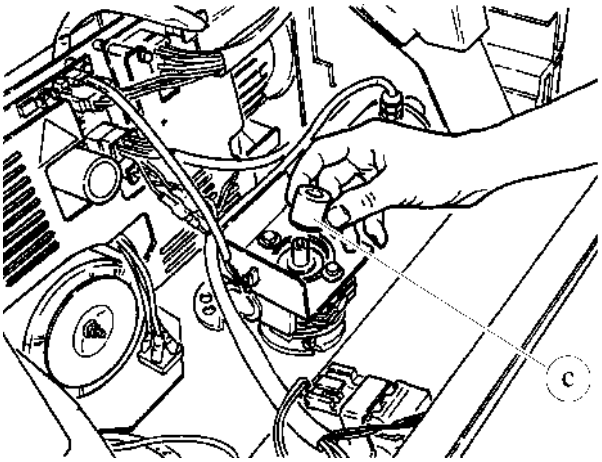

Figure 7.17-2

Carry out the procedure described in paragraph 7.16. “Disassembling the elevation motor belt” up to the slackening of the belt (step 7).

1. Disconnect the motor power supply cable and the photocell cable.

2. If present, use a 10-mm wrench to remove the 2 fixing screws from the cover of the protective housing of encoder wheel **a**.

3. Open the cover.

4. Use a 10-mm wrench to remove screw **b**.
5. Disassemble encoder wheel **a**.

6. Remove the spacer **c**.

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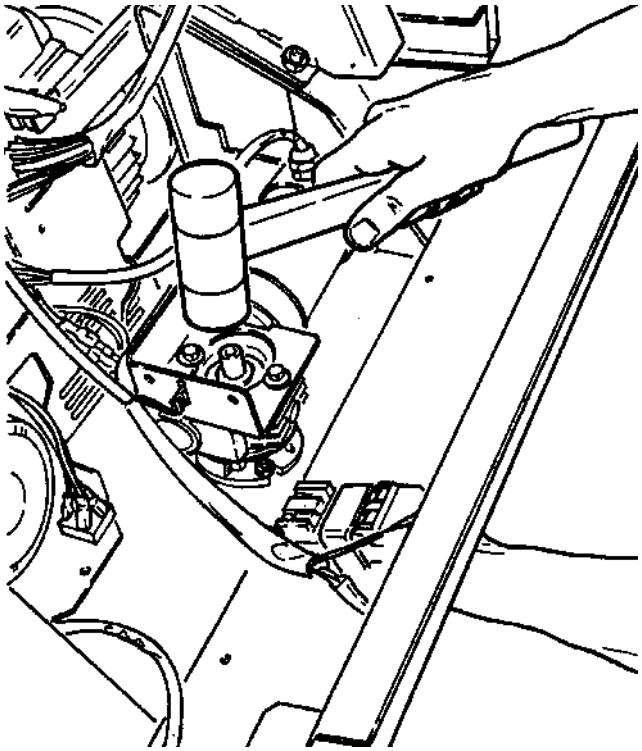

Figure 7.17-3

7. Strike the motor shaft with a rubber hammer, and, using a pointed tool if necessary, remove the shaft from the lower side of the machine.

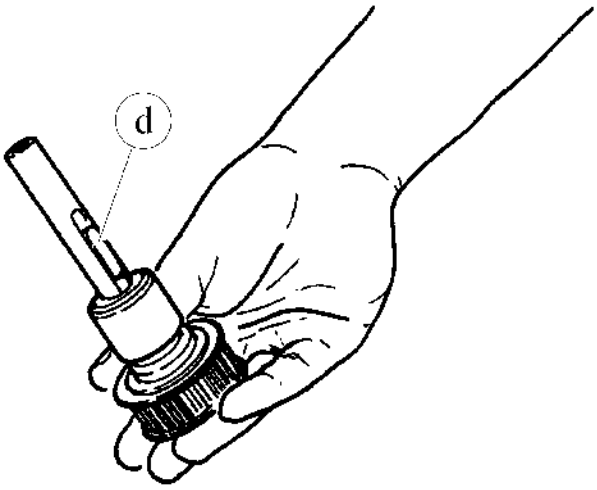

Figure 7.17-4

8. Recover the tab **d**.

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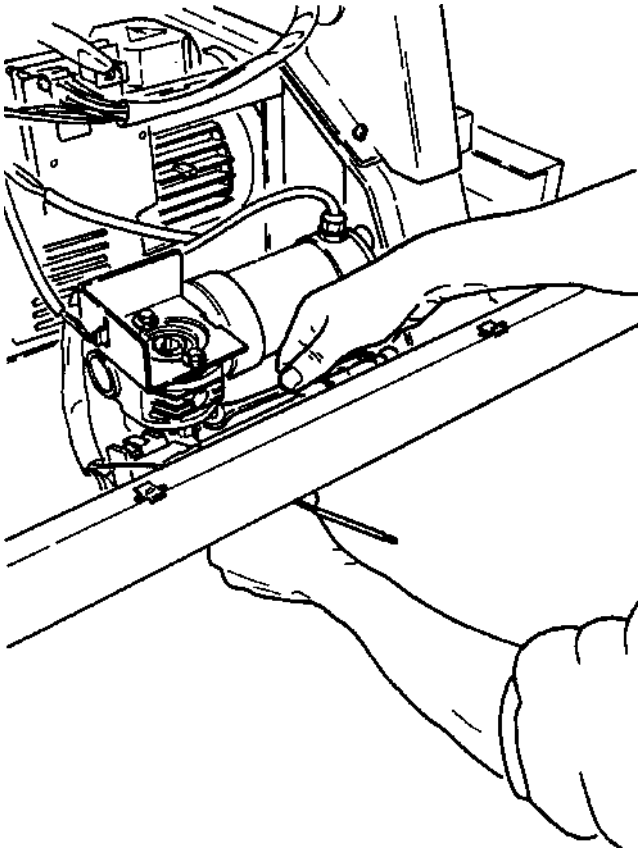

Figure 7.17-5

9. Disassemble protective housing of the encoder wheel, using, depending on the type of motor:
   - "BONFIGLIOLI" motor: 10-mm wrench;
   - "SITI" motor: 8-mm wrench.
10. Unscrew the 4 fixing screws of the ELEVATION MOTOR using a 4-mm Allen T wrench and holding the nut in place with a 10-mm wrench.
11. Remove the ELEVATION MOTOR.

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

After completing the procedure, adjust the tension of the elevation motor belt as instructed in paragraph 8.5. .

7.18. DISASSEMBLING THE ELEVATION MOTOR BRUSHES

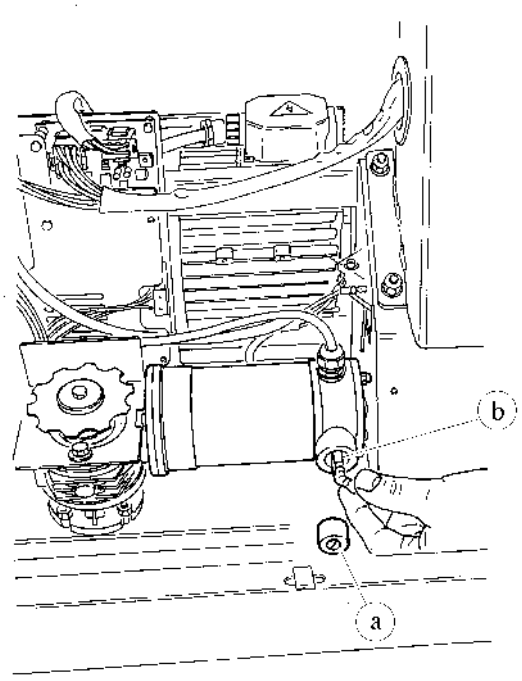

Figure 7.18-1

Carry out the procedures described in paragraphs 7.9. "Disassembling the motor guard" and 7.10. "Disassembling the front plate".

1. Manually, or using a small flat-head screwdriver, unscrew the protective caps **a** of the brushes.
2. Remove the BRUSHES **b**.

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

7.19. DISASSEMBLING THE ELEVATION BARS

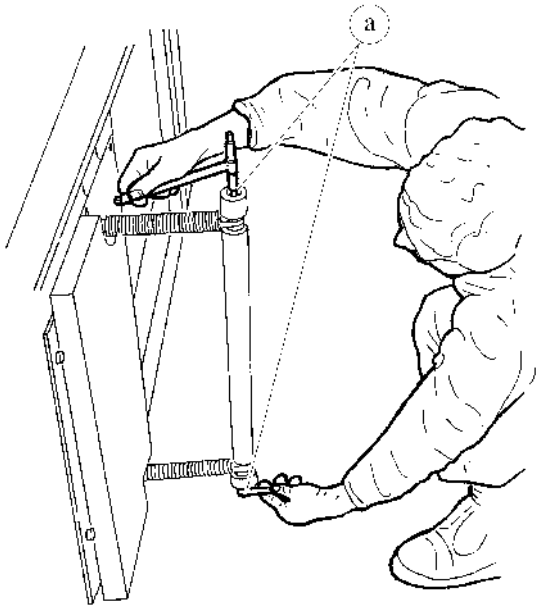

Figure 7.19-1

1. Set the elevation at 7%.

Carry out the operations described in paragraphs 7.9. "Disassembling the motor guard" and 7.10. "Disassembling the front plate".

2. Overturn the machine on its right hand side.
3. Unscrew the two fixing screws of wheels **a** using two 6-mm T wrenches.

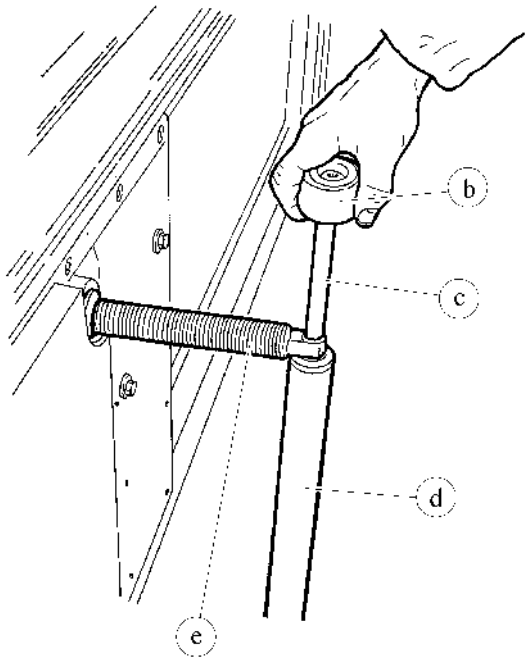

Figure 7.19-2

4. Remove wheel **b**.
5. Remove the wheel shaft **c**.
6. Remove spacer **d**.
7. Remove, unscrewing them by hand, the 2 ELEVATION BARS **e**.

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

During the reassembly phase, lubricate the elevation bars with MOLYKOTE GN PLUS grease.

After completing the procedure, adjust the alignment of the ELEVATION BARS as instructed in paragraph 8.6. .

7.20. DISASSEMBLING THE LEAD SCREW NUTS

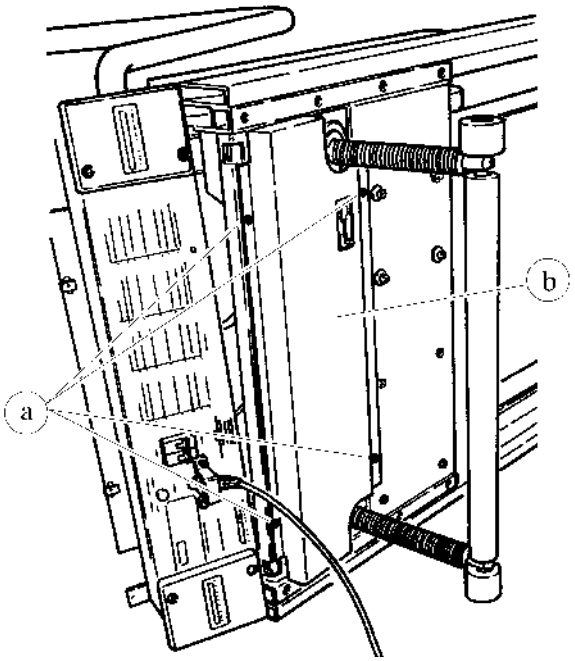

Figure 7.20-1

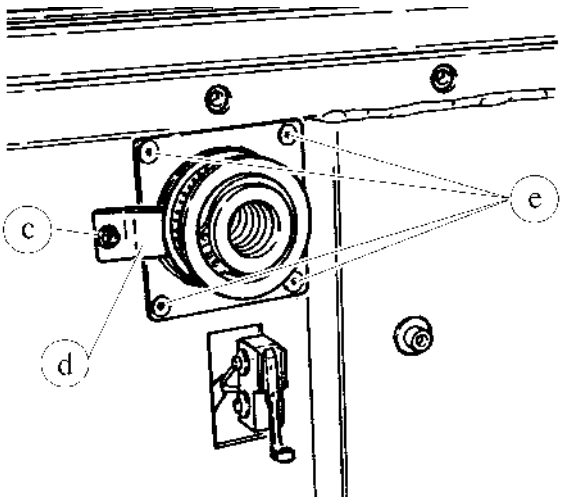

Figure 7.20-2

1. Set the elevation at 7%.

Carry out the procedures described in paragraphs 7.9. "Disassembling the motor guard" and 7.10. "Disassembling the front plate".

2. Overturn the machine on its right hand side.

3. Using a large Phillips screwdriver unscrew the 4 self-tapping screws **a**.
4. Remove the belt guard **b**.

Carry out the procedure described in paragraph 7.19. "Disassembling the elevation bars".

5. Back off the bearing clamp screw **c** using a 4-mm Allen T wrench.
6. Rotate the clamp **d**.
7. Unscrew the 4 screws **e** using a 4-mm Allen T wrench.

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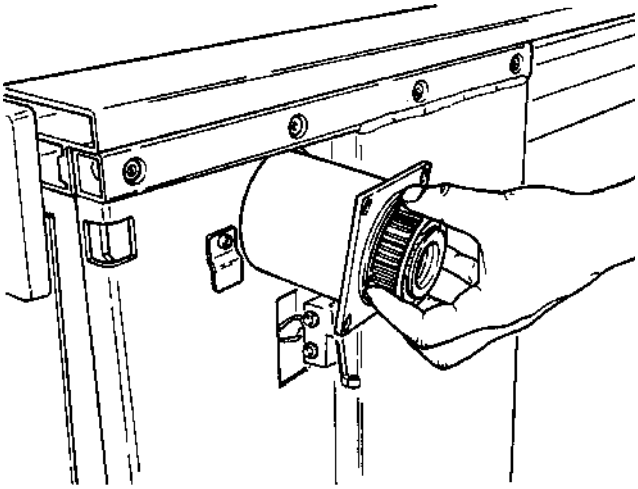

Figure 7.20-3

8. Remove the LEAD SCREW NUT GROUP.

To reassemble the LEAD SCREW NUT GROUP, carry out the above steps in reverse order.

7.21. DISASSEMBLING THE LIMIT SWITCHES

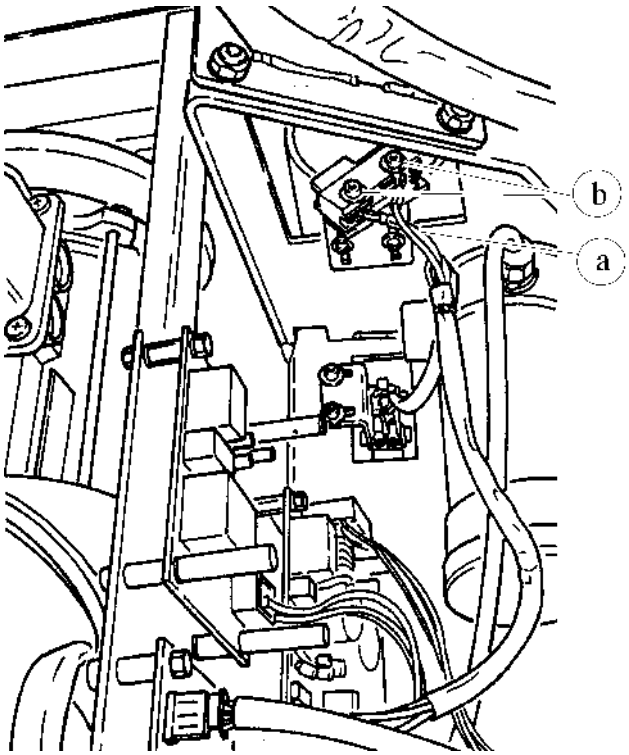

Figure 7.21-1

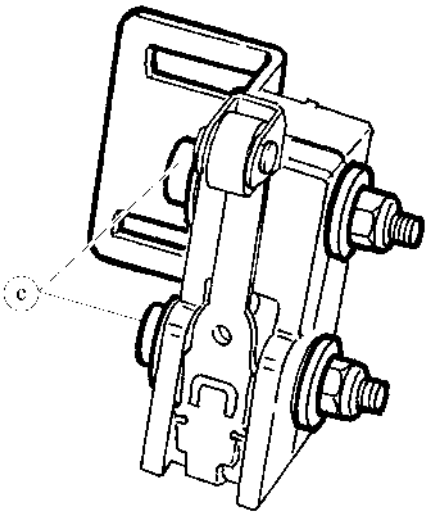

Figure 7.21-2

Carry out the procedures described in paragraphs 7.9. "Disassembling the motor guard" and 7.10. "Disassembling the front plate".

To remove the LIMIT SWITCHES:

1. Disconnect the cables **a**.
2. Unscrew the 2 fixing screws **b** of the LIMIT SWITCH support bracket using a 3-mm Allen T wrench.
3. Remove the LIMIT SWITCH group and the supporting bracket.

4. To remove the LIMIT SWITCHES from the supporting bracket, unscrew the 2 screws **c** using a 3-mm Allen T wrench while holding the nut underneath in place with an 8-mm wrench.

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

When reconnecting the cables, remember that the UPPER LIMIT SWITCH is connected between terminals 1 and 3, and the LOWER LIMIT SWITCH is between terminals 1 and 2.

7.22. DISASSEMBLING THE PHOTOCELL

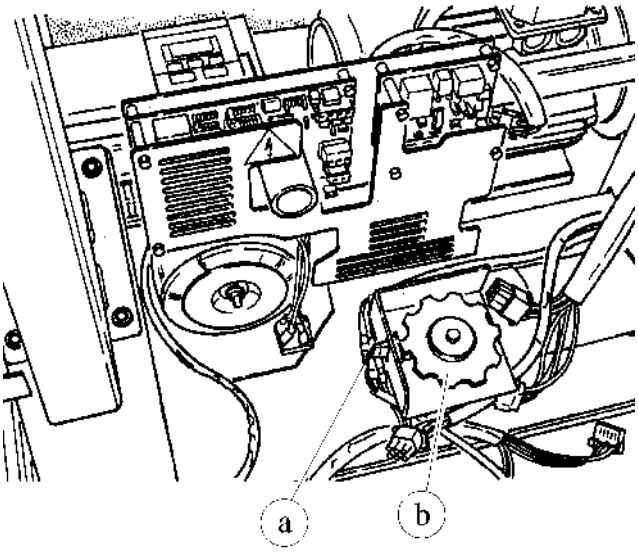

Figure 7.22-1

Carry out the procedures described in paragraphs 7.9. "Disassembling the motor guard" and 7.10. "Disassembling the front plate".

1. Disconnect connector **a** on the PHOTOCELL board.

2. Using a 10-mm wrench, unscrew the 2 screws fixing the cover of the protective housing of encoder wheel **b** if present.
3. Open the cover.

4. Unscrew the 2 screws fixing the PHOTOCELL board to the support using a small Phillips screwdriver.
5. Remove the PHOTOCELL board.

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

After completing the procedure, adjust the centering of the photocell as instructed in paragraph 8.8. .

8. ADJUSTMENTS

8.1. TENSIONING A NEW TREAD BELT

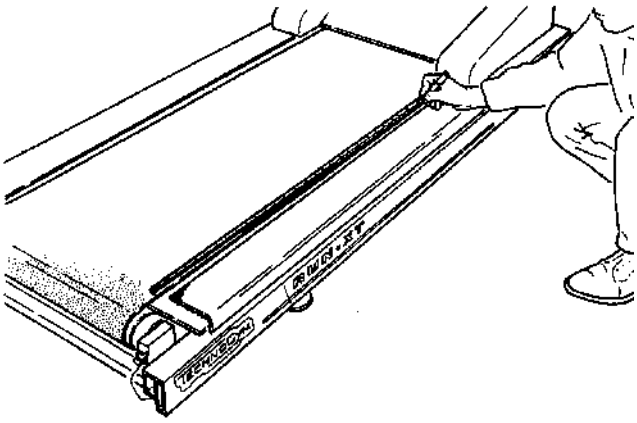

Figure 8.1-1

1. After assembling the new tread belt, place a tape measure along the right hand edge of the tread belt, and use a pen make two reference marks on the tread belt at a distance of exactly 1 meter from each other.

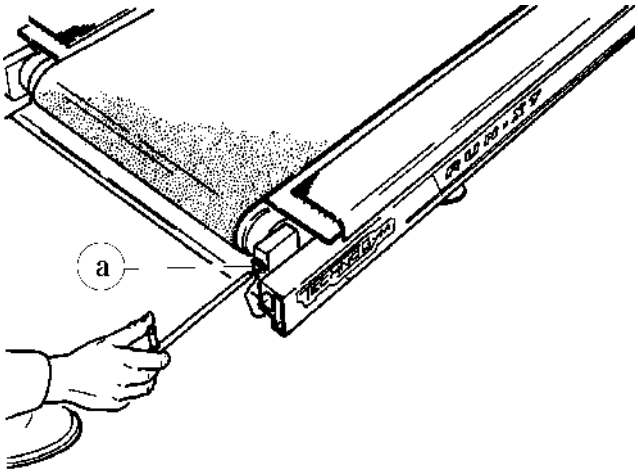

Figure 8.1-2

2. Lock down the right hand tread belt tensioner screw **a** until the distance between the reference marks increases by 7 mm.
3. Lock down the left hand tread belt tensioner screw until the driven roller is aligned with the crosspiece.

After completing this procedure, any further adjustments should be performed using only the left-hand tensioning screw.

After completing this procedure, check the centering of the tread belt as instructed in paragraph 8.3.

8.2. TENSIONING A USED TREAD BELT

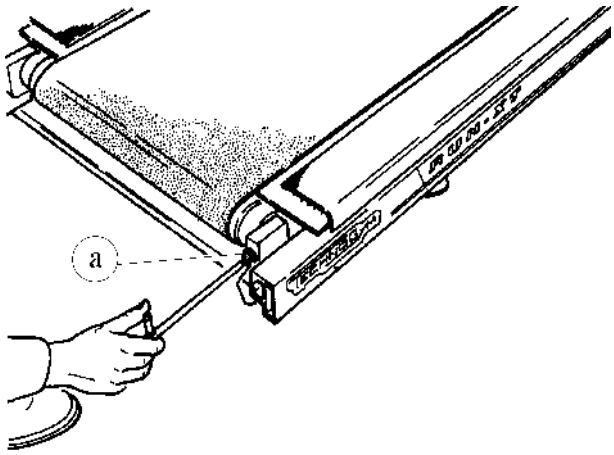

Figure 8.2-1

1. Before disassembling the used tread-belt, place a tape measure along the right-hand edge of the tread-belt and, using a pen, make two reference marks spaced exactly **1 meter** apart.
2. After reassembling the used belt, lock down the right belt tensioning screw **a** until the two reference marks on the tread-belt are once again 1 meter apart.

3. Lock down the left belt tensioning screw until the rear roller is aligned with the crosspiece.

This procedure is usually carried out after replacing the motor or rear roller, or in cases where the used tread-belt must be reassembled: it is not possible to perform the procedure as described in paragraph 8.1. because the used tread-belt is not sufficiently elastic.

After completing this procedure, check the centering of the tread-belt as described in paragraph 8.3. .

8.3. CENTERING THE TREAD BELT

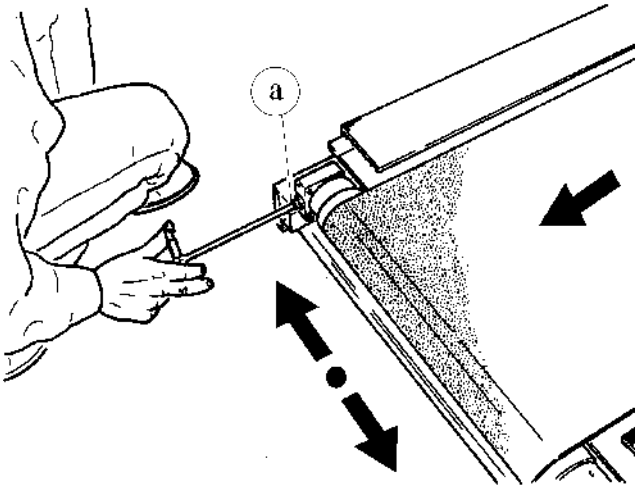

Figure 8.3-1

1. Start the machine at a speed of 10 km/h.
2. Observe the movement of the tread belt, correcting any tendency to shift to the right or left exclusively by adjusting the left tensioning screw **a**. Locking down this screw favors shifting of the belt to the right and vice versa.
3. Gradually increase the speed to 16 km/h, making any small adjustments which may be necessary until the tread belt is perfectly centered.

8.4. ADJUSTING THE TENSION AND ALIGNMENT OF THE TREAD-BELT MOTOR BELT

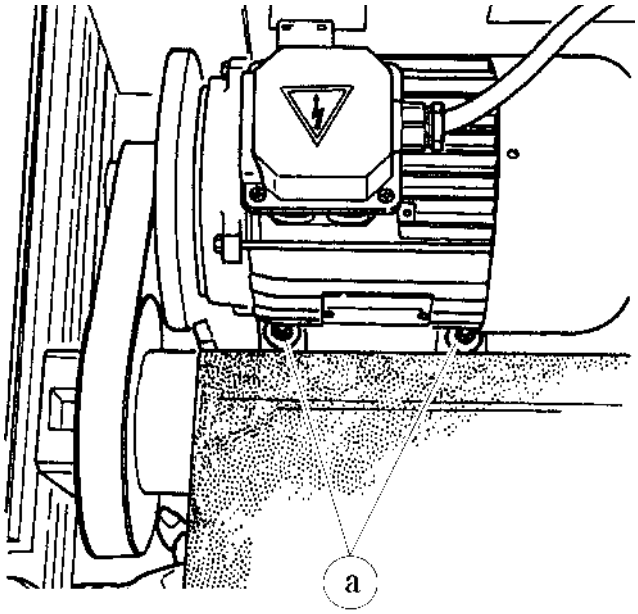

Figure 8.4-1

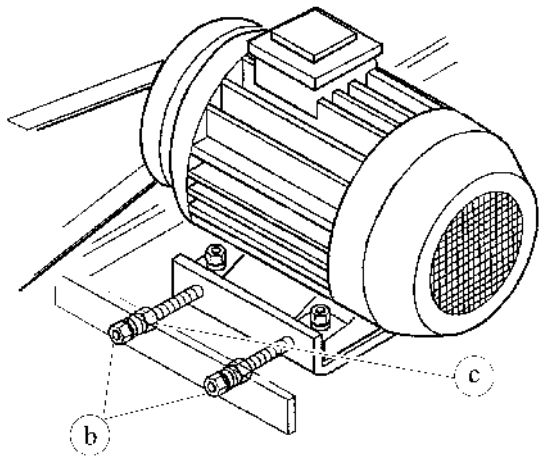

Figure 8.4-2

Carry out the procedures described in paragraphs 7.9. "Disassembling the motor guard" and 7.10. "Disassembling the front plate".

1. Remove the dust guard.

2. Back off the 4 nuts **a** (2 are concealed by the motor in the figure at left) fixing the belt motor to the machine frame, using a 13-mm screw and holding the screw underneath in place with a 6-mm Allen T-wrench.

3. Back off the 2 outer nuts **b** using a 13-mm wrench.
4. Use a tension gauge for belts.
5. Turn the 2 inner adjusting nuts **c** using a 13-mm wrench until the instrument measures a tension of 35 kg.

If a tension gauge is not available, the tension of the motor belt is correct when:

- **it yields by 0.5 - 1 cm when pressed vertically with the hand.**
- **it does not slip when the tread belt is blocked at 0.8 km/h.**

After completing this procedure, lock down the fixing nuts and check the belt tension again.

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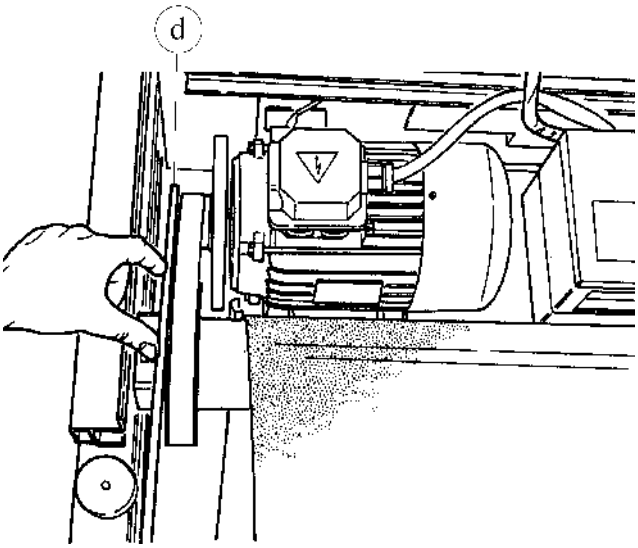

Figure 8.4-3

To adjust the alignment, use a straight-line reference rod **d**, rested against the driving roller pulley, and make sure that:

- The pulley and flywheel are parallel.

1. Repeat steps 3 and 4.
2. Make the adjustment by turning the 2 inner adjuster nuts **c** using a 13-mm wrench.

- The pulley and flywheel are aligned.

1. Repeat step 3.
2. Make the adjustment by shifting the motor.

8.5. TENSIONING THE ELEVATION MOTOR BELT

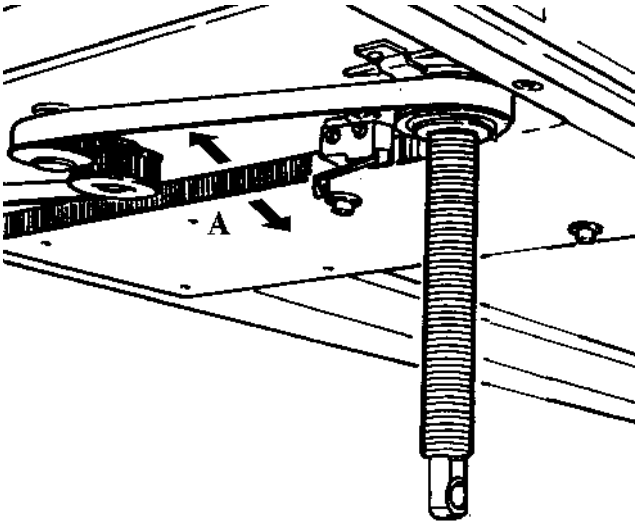

Figure 8.5-1

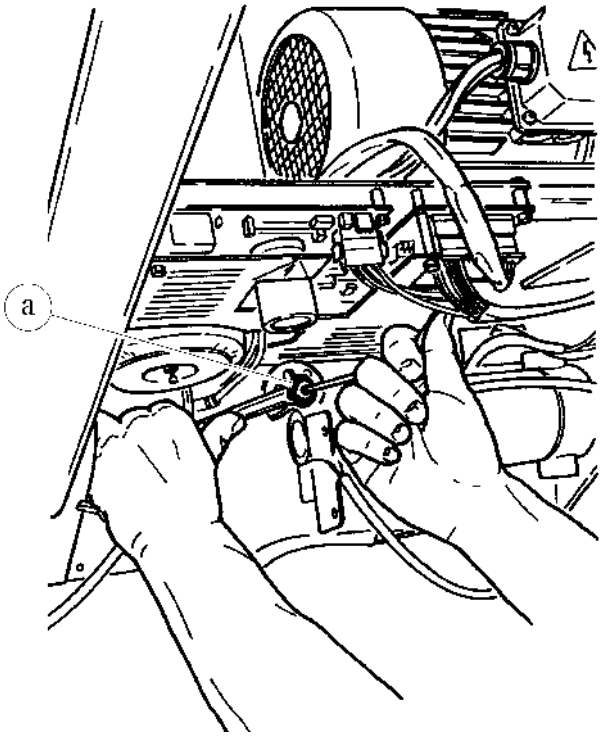

Figure 8.5-2

Carry out the procedures described in paragraphs 7.9. "Disassembling the motor guard" and 7.10. "Disassembling the front plate".

1. Place the machine on its maximum elevation position.

2. Remove the belt guard.

The elevation motor belt tension is correct when it has a play of approximately 1.5 cm at the point A indicated by the arrow.

3. Back off the chain tightener nut **a** using a 17-mm wrench and holding the pivot in place with a 5-mm Allen T wrench.
4. Adjust the chain tightener to obtain the correct belt tension.

5. After completing the adjustment, lock down the chain tightener nut.

8.6. ALIGNING THE ELEVATION BARS

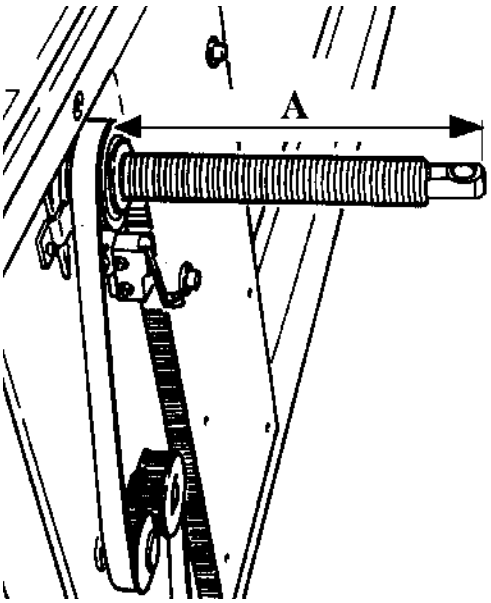

Figure 8.6-1

1. With the machine turned over on one side, turn one of the elevation bars until the wheel shaft holes on both bars are aligned.
2. Use a gauge to make sure that both elevation bars project by the same distance **A** from the lead screw nuts. If this is not the case, turn one of the bars by half a turn at a time and repeat the measurement until perfect alignment is obtained.
3. Reassemble the wheel shaft.

This procedure must be carried out whenever the wheel shaft is reassembled.

8.7. CALIBRATING THE TREAD BELT SPEED

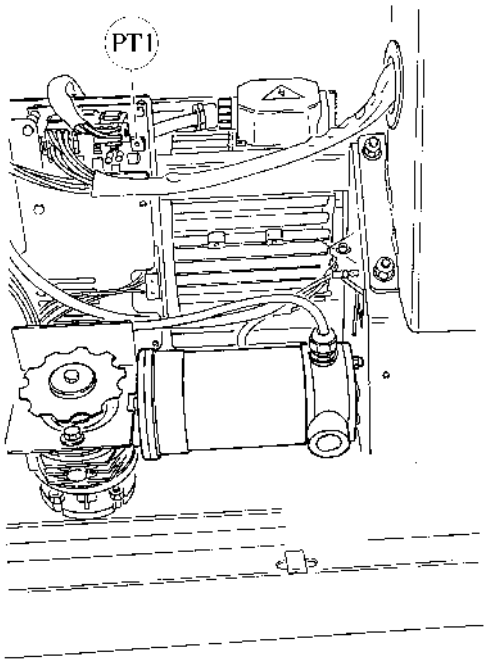

Figure 8.7-1

Carry out the procedure described in paragraph 7.9. "Disassembling the motor guard".

The operations described below must be carried out with the machine powered up; they should be performed exclusively by a QUALIFIED TECHNICIAN who must ensure that there are no unauthorized persons near the machine.

1. Plug the mains lead into the wall outlet.
2. Turn on the machine.
3. Start the tread belt and set the speed at 12.6 km/h (European version) or 9.0 mph (USA version).
4. View the belt motor control frequency on the inverter display.
5. Adjust potentiometer **PT1** on the inverter interface board, using a small flat-blade screwdriver, until the frequency shown on the inverter display is 69 Hz (European version) or 79.3 (USA version).

8.8. CENTERING THE PHOTOCELL

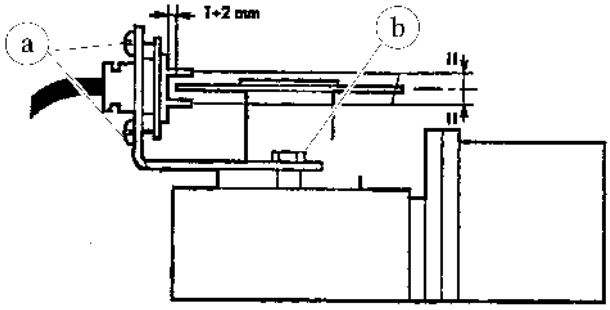

Figure 8.8-1

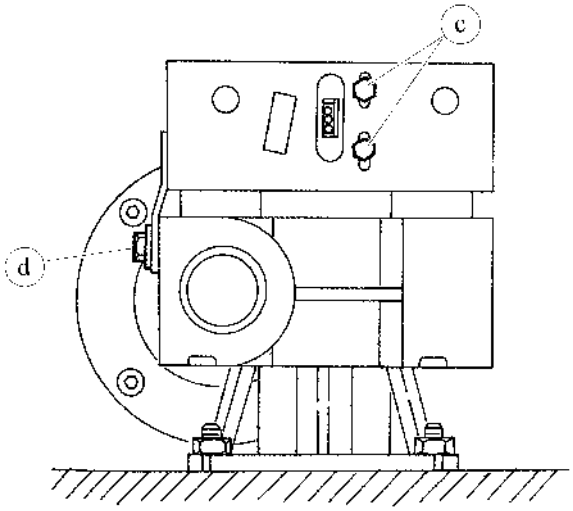

Figure 8.8-2

Carry out the procedures described in paragraphs 7.9. "Disassembling the motor guard" and 7.10. "Disassembling the front plate".

1. Using a 10-mm wrench, unscrew the 2 fixing screws of the cover of the protective housing of the encoder wheel, where present.
2. Open the cover.

For the "BONFIGLIOLI" motor:

3. Adjust the centering of the encoder photocell by turning the 2 screws **a** and **b** so that the photocell is positioned as shown in Figure 8.8-1.

For the "SITI" motor:

4. Adjust the centering of the encoder photocell by turning the 2 screws **c** and **d** so that the photocell is positioned as shown in Figure 8.8-2.

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9. CONFIGURING THE MACHINE

9.1. USER SETTING PARAMETERS

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:

- **EPROM I-D-GB**

KEY	LANGUAGE
1	ITALIAN
2	DEUTSCH
3	UK ENGLISH

- **EPROM USA-F-NL**

KEY	LANGUAGE
1	USA ENGLISH
2	FRANCAIS
3	NEDERLANDS

- **EPROM USA-J**

KEY	LANGUAGE
1	USA ENGLISH
2	JAPANESE

- **EPROM E-P**

KEY	LANGUAGE
1	SPANISH
2	PORTUGUESE

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:

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:

MAX TIME = xxx

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:

+/- KEYS / CPR = xxx

press the proper numeric key (**1** or **2**) to choose the desired setting, as for the following table:

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:

FUNCTION KEYS = xxx

press the proper numeric key (**1** or **2**) to choose the desired setting, as for the following table:

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:

ENTER TO INCREASE TIME = xxx

press the proper numeric key (**1** or **2**) to choose the desired setting, as for the following table:

KEY	"ENTER" KEY
1	OFF = DISABLED
2	ON = ENABLED

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

9.1.7. SETTING THE PRIORITY

For cases where both the chest band and hand sensor are present, it is possible to configure which one should be the priority source for the heart rate display. Obviously, if there is a signal available from only one of the 2 sources, it will be used even if it has not been configured as the priority source. To change this setting, when the LED display is showing the current priority value, press the number keys (from **1** to **2**) to set the desired priority as shown in the following table:

KEY	PRIORITY
1	CHEST BAND PRIORITY
2	HEART SENSOR PRIORITY

then press **ENTER** to confirm the changes made.

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. TECHNICAL SETTING PARAMETERS

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 **2501** (the password) and press **ENTER** to confirm. At this point, the setting procedure will show on the LED matrix the actual settings.

9.2.1. ENABLING USE OF THE HAND SENSOR

It is possible to enable the use of the sensors acquisition of the heart rate. To change this setting, when the LED display is showing the current configuration, press the number keys (from **1** to **2**) to enable or disable the hand sensor, as indicated in the table below:

KEY	HEART SENSOR
1	OFF = DISABLED
2	ON = ENABLED

then press **ENTER** to confirm the changes made.

9.2.2. ENABLING THE DISPLAY MODE

It is possible to enable a display mode function which automatically scrolls the data shown on the 7 segment display. To change the setting, when the LED display is showing the current configuration, press the number keys (from **1** to **2**) to enable or disable the scrolling function, as shown in the table below:

KEY	DISPLAY MODE
1	OFF = DISABLED
2	ON = ENABLED

then press **ENTER** to confirm the 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.

9.3. 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.

9.3.1. HOURS ON

The number of hours the machine has been turned on:

HOURS ON = xxx

Press **ENTER** to go ahead.

9.3.2. HOURS OF USE OF THE BELT MOTOR

The number of hours the belt motor has been operating:

HOURS MOTOR = xxx

Press **ENTER** to go ahead.

9.3.3. MINUTES OF USE OF THE EVELATION MOTOR

The number of minutes the elevation motor has been operating:

MIN. UP/DOWN = xxx

Press **ENTER** to go ahead.

9.3.4. DISTANCE COVERED

The distance in Km covered by the belt:

KM DONE = xxx

Press **ENTER** to go ahead.

The equipment will now return to the standby mode.

9.4. 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.

9.4.1. HOURS ON

To change this value, when the value actually in memory will scroll on the LED matrix:

HOURS ON = xxx

input the desired value using the numeric keys to enter and press **ENTER** to confirm. Just press **ENTER** to maintain the original value.

9.4.2. HOURS OF USE OF THE BELT MOTOR

To change this value, when the value actually in memory will scroll on the LED matrix:

HOURS MOTOR = xxx

input the desired value using the numeric keys to enter and press **ENTER** to confirm. Just press **ENTER** to maintain the original value.

9.4.3. MINUTES OF USE OF THE EVELATION MOTOR

To change this value, when the value actually in memory will scroll on the LED matrix:

MIN. UP/DOWN = xxx

input the desired value using the numeric keys to enter and press **ENTER** to confirm. Just press **ENTER** to maintain the original value.

9.4.4. DISTANCE COVERED

To change this value, when the value actually in memory will scroll on the LED matrix:

KM DONE = xxx

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.

9.5. PROGRAMMING THE HITACHI SJ100 INVERTER

The inverter can be programmed using the special keypad installed on board the machine. It is necessary to correctly configure the values of the main functions labeled with an F, and those of the extended functions labeled with A, b, C and H.

If programming an inverter that is not assembled on the machine, before proceeding with the other operations:

- **connect the mains power supply to terminals L1 and N;**
- **place a jumper between terminals 3 and P24;**
- **place a jumper between terminals AL1 and AL0.**

When the inverter is energized, function parameter d01 appears on the display: this is the inverter output frequency toward the motor.

To display the inverter monitor parameters (d type) or those of another main function:

1. Press the “1” or “2” key until the desired main function appears.
2. Press the “FUNC” key once to display the value of the parameter.
3. To modify the value, press the “1” key to increase or the “2” key to decrease.
4. To exit and save the modified value, press the “STR” key; to exit without saving press the “FUNC” key. After this, the display will revert to showing the selected main function.

To display the extended function parameters:

1. Press the “1” or “2” keys to display the desired function: A--, b--, C-- o H--.
2. Press the “FUNC” key to display the code of the extended function: for example the display will show A01.
3. Press the “1” or “2” key until the desired extended function appears. The display of the extended function parameters is cyclical, and after scrolling the type A parameters it goes on to type b and so on.
4. Press the “FUNC” key once to display the value of the parameter.
5. To modify the value, press the “1” key to increase or the “2” key to decrease.
6. To exit and save the modified value, press the “STR” key; to exit without saving press the “FUNC” key. After this the display reverts to showing the selected extended function.
7. To exit extended function menu, press the “FUNC” key until it shows A--, b--, C-- o H--.

Incorrect programming of the inverter may result in serious damage to the machine or improper operation potentially hazardous for the user. Therefore, carry out this operation only if certain of being able to perform the procedure correctly.

WARNING: when the programming has been completed, remember to set displayed the value of the parameter d01 (motor frequency).

9.5.1. MONITOR FUNCTION PARAMETERS

Parameter	Description
d01	Motor output frequency
d02	Motor current draw
d04	Direction of movement
d05	Status monitor of intelligent terminal input signals
d06	Status monitor of intelligent terminal output signals
d07	"Converted" motor output frequency
d08	Monitor of last alarm condition
d09	List of the last error conditions

9.5.2. MODIFIED PARAMETER SETTINGS

The following table shows the parameters which must be configured with a different value from the inverter defaults:

Parameter	Description	Value
F02	Acceleration	15
F03	Deceleration	15
A04	Maximum frequency setting	98
A81	Selection of AVR function	01
A82	Selection of voltage of AVR function for the motor	240
b12	Level of electronic thermal setting	8.00
b22	Level of overload restriction setting	12.00
b83	Carrier frequency setting (KHz)	16.0
b90	Dynamic braking usage ratio	20
C13	Condition of terminal 3 setting	01
C03	Function of terminal 3 setting	12
C41	Level of overload signal setting	8.00
H02	Motor data selection	01
H03	Motor capacity setting	1.5
H05	Motor constant K_p setting	80
H20	Motor constant R1 setting	1.124
H21	Motor constant R2 setting	0.788
H22	Motor constant L setting	8.79
H23	Motor constant Io setting	3.65
H24	Motor constant J setting	20.0
H30	Motor constant R1 (Autotuning data)	1.124
H31	Motor constant R2 (Autotuning data)	1.500
H32	Motor constant L (Autotuning data)	8.99
H33	Motor constant Io (Autotuning data)	3.95
H34	Motor constant J (Autotuning data)	20.0

 **Before modifying the value of function C0, modify the value of function C13.**

9.6. PROGRAMMING THE HITACHI J100 INVERTER

The Hitachi inverter can be programmed using the standard keyboard. The values of the main functions, indicated with the letter F, and those of the extended functions, indicated the letters A and C, must be correctly configured.

With the inverter powered up, the display shows the parameters for function F 1. To display the parameters of another main function:

5. Press the FUNC key until the desired main function appears.
6. Press the 1 key once to display the value of the parameter.
7. To modify the value, press the 1 key to increase or the 2 key to decrease.
8. To save the modified value, press the FUNC key: the display reverts to showing the value of the selected main function.

To display the parameters of the extended functions:

8. Press the FUNC key until function F 14 appears.
9. Press the 1 key to display the code of the extended function: for example the display will show 0 to indicate A 0. When the value . 0 appears it means that the type C extended functions are available.
10. Press the FUNC key to access the extended function: the display will show A 0.
11. Press the 1 key once to view the value of the parameter: the display will show the value of the parameter for the selected extended function.
12. To modify the value, press the 1 key to increase, or the 2 key to decrease.
13. To save the modified value, press the FUNC key: the display will revert to showing the value of the selected extended function.
14. Press the FUNC key again to return to the main function menu.

Incorrect programming of the inverter may result in serious damage to the machine or improper operation potentially hazardous for the user. Therefore, carry out this operation only if certain of being able to perform the procedure correctly.

WARNING: when the programming has been completed, remember to set displayed the value of the parameter F1 (monitoring function).

The tables below show the values of the function parameters, and indicate which of those parameters take on a different value from the inverter default.

MAIN FUNCTIONS		
FUNCTION	**Value**	**Default**
F 1	-	
F 2	-	
F 4	F	YES
F 5	_ _	
F 6	15	
F 7	15	

FUNCTION	**Value**	**Default**
F 8	11	YES
F 9	03	YES
F 10	72	YES
F 11	220	YES
F 14	0	YES

EXTENDED FUNCTIONS					
FUNCTION	**Value**	**Default**	**FUNCTION**	**Value**	**Default**
A 0	2		A 37	220	YES
A 1	1.1		A 38	5	YES
A 2	4	YES	A 39	100	YES
A 3	0.0	YES	A 40	100	YES
A 4	0.5	YES	A 41	1	YES
A 5	0	YES	A 42	0	
A 6	0	YES	A 43	0	YES
A 7	0	YES	A 48	1	
A 8	0	YES	A 49	2	YES
A 9	0	YES	A 50	1	YES
A 10	16	YES	A 51	0	YES
A 11	8	YES	A 52	1	YES
A 12	0	YES	A 53	0	YES
A 13	0	YES	A 55	0	YES
A 14	0	YES	A 56	1	YES
A 15	0	YES	A 57	0	YES
A 16	0	YES	A 58	1	YES
A 17	0	YES	A 62	50	YES
A 18	10.0	YES	A 63	98	
A 19	10.0	YES	A 64	0	YES
A 20	0.5	YES	A 68	0.5	YES
A 21	0	YES	A 71	0	YES
A 22	0	YES	A 80	136	YES
A 23	100	YES	A 81	132	YES
A 24	1	YES	A 82	1.0	YES
A 26	1.5		A 83	10.0	YES
A 27	97		A 84	0	YES
A 28	0	YES	A 85	1.0	YES
A 29	0	YES	C 0	09	
A 30	150	YES	C 1	02	YES
A 31	150	YES	C 2	07	YES
A 32	0	YES	C 3	11	YES
A 33	0	YES	C 4	00	YES
A 34	0	YES	C 10	00	YES
A 35	0	YES	C 20	01	
A 36	0	YES	C 21	03	YES

Before modifying the value of function C 0, modify the value of function C 20.

10. SCHEDULED MAINTENANCE

To keep the machine in perfect working order and prevent the risk of malfunction, it is necessary to perform the scheduled maintenance operations set out in the table below. There are 3 basic types of maintenance operations:

- External cleaning operations;
- Routine maintenance operations;
- Special maintenance operations.

The prescribed frequency differs for each type of operation, as does the required level of operator qualification. The following paragraphs detail the recommended procedures.

10.1. EXTERNAL CLEANING OPERATIONS

These operations can be carried out by the owner of the machine and do not require any special skills.

The external cleaning operations are involve simple cleaning for the purposes of general hygiene. These should be performed **at least once a week**.

For external cleaning, proceeds as follows:

10.1.1. SETTING UP THE OPERATION

1. Turn off the machine by placing the switch in the 0 position (OFF).
2. Unplug the mains lead from the wall outlet.

10.1.2. CLEANING OPERATIONS

1. Using a cloth moistened with a neutral detergent (non acidic), clean the entire machine, taking care not to rub too vigorously, especially on the keys of the display.

Never spray the cleaning product directly on the machine.

WARNING: do not use alcohol, petrol or chemical products in general.

10.1.3. LUBRICATING THE TREAD BELT

1. With the machine powered up but stopped, clean the entire surface between the tread belt and the running track using a cloth. Repeat several times if necessary.
2. Then lubricate the entire length of the running track and tread belt using the oil that comes with the service box.
3. Start the machine at a speed of approximately 3 km/h (2 mph) and walk on it, taking care to tread on the entire width of the belt, so as to facilitate the distribution of the oil on the entire surface of the belt.

10.2. ROUTINE MAINTENANCE OPERATIONS

These operations can be carried out by the owner of the machine and do not require any special skills.

The routine maintenance operations involve simple cleaning, lubrication and checking the state of wear and emergency operation, in order to ensure the correct and safe operation of the machine. It is recommended to perform these operations **at least once a month**.

For the routine maintenance of the machine, proceed as follows:

10.2.1. INTERNAL CLEANING OPERATIONS

1. Turn off the machine by placing the switch in the 0 position (OFF).
2. Unplug the mains lead from the wall outlet.
3. Open the motor guard.
4. Use a vacuum cleaner to clean the interior, paying particular attention to the tread belt motor, the inverter and the electronic circuit boards.

WARNING: when carrying out these operations, be careful not to damage the cables.

5. Pull out the dust filter and clean it using compressed air or a vacuum cleaner.
6. Move the machine and clean the floor underneath using a vacuum cleaner.

10.2.2. LUBRICATING THE ELEVATION BARS

Carry out these operations approximately every 2 months, or in any case when the bars are in need of lubrication.

1. With the machine powered up, raise it to its maximum elevation (15%).
2. Turn off the machine by placing the switch in the 0 position (OFF).
3. Thoroughly clean the elevation bars with a cloth and then lubricate them over their full length with Molykote GN grease.
4. Turn on the machine by placing the switch in the 1 position (ON).
5. Start the machine again, going through a few complete up and down movements of the elevation bars.
6. Check the elevation bars, adding more grease if necessary.

10.2.3. CHECKING THE STATE OF WEAR

1. With the machine stopped, check the state of wear of the entire surface of the tread belt, turning it by hand. If any anomalies are found, call in the authorized Technogym Technical Service.
2. Check the state of wear of the running track by lifting the tread belt in the middle. If any anomalies are found, call in the authorized Technogym Technical Service.

10.2.4. CHECKING AND CENTERING THE TREAD BELT

1. With the machine stopped, check the tension of the entire surface of the tread belt, turning it by hand. If any anomalies are found, call in the authorized Technogym Technical Service or adjust the tension.
2. With the machine moving at a speed of approximately 10 km/h (7 mph), check the centering of the tread belt. If any anomalies are found, call in the authorized Technogym Technical Service or adjust the centering.

10.2.5. CHECKING THE EMERGENCY BUTTON

1. With the machine turned on and moving at a speed of approximately 5 km/h (3 mph), press the emergency button and check that the machine stops, displaying the message: “ACTIVATED SECURITY”.

10.3. SPECIAL MAINTENANCE OPERATIONS

These operations can only be carried out by a qualified technician specifically trained by Technogym and authorized to carry out machine installation and adjustments, as well as special maintenance operations or repairs which require special knowledge of the machine, its operation, safety systems and working procedures.

The special maintenance operations involve checking the operation, wear and tension of the mechanical components so as to ensure perfect and safe operation of the machine. It is recommended to carry out these operations **at least once every 6 months**.

For the special maintenance of the machine, proceed as follows:

10.3.1. CARRYING OUT THE ROUTINE MAINTENANCE PROCEDURE

1. Carry out the procedures described in paragraph 10.2. “Routine maintenance operations”.

10.3.2. CHECKING THE WORKING CONDITIONS

1. Check that the special plate is present under the machine wheels.
2. Check that the machine is connected directly to the wall outlet, without any extension cords, and that the outlet is correctly earthed.
3. Using a multimeter, check that the machine earth node is correctly connected to earth.

10.3.3. CHECKING THE WIRING AND CONNECTIONS

1. Open all the machine guards.
2. Check the condition of all the cables:

   - External conditions;
   - Possible rusting of the connectors;
   - Electrical continuity of the individual wires;
   - Isolation of the individual wires toward ground.

   Repair and/or replace any non-conforming wires.

3. Check the condition of the fuse using a tester.

10.3.4. CHECKING THE DISPLAY

1. Check the operation of all the keys on the keyboard.
2. Check the operation of all the LEDs and the buzzer on the display.

10.3.5. CHECKING THE WEAR OF THE MOTOR ROLLER

1. Turn off the machine by placing the switch in the 0 position (OFF).
2. Unplug the mains lead from the wall outlet.
3. Open the motor guard.
4. Check the state of wear of the motor roller. Replace if it shows evident signs of wear.

10.3.6. CHECKING THE WEAR OF THE REAR ROLLER

1. Turn off the machine by placing the switch in the 0 position (OFF).
2. Unplug the mains lead from the wall outlet.
3. Check the state of wear of the rear roller. Replace if it shows evident signs of wear.

10.3.7. CHECKING THE WEAR OF THE RUBBER HANDLEBAR COVERS

1. Check the state of wear of the rubber covering on the 2 side handlebars and on the center handlebar. Replace if they show evident signs of wear.

10.3.8. CHECKING THE TREAD BELT MOTOR DRIVE-BELT

1. Turn off the machine by placing the switch in the 0 position (OFF).
2. Unplug the mains lead from the wall outlet.
3. Open the motor guard.
4. Check the state of wear of the tread motor drive-belt, turning it by hand using the motor flywheel. Replace if it shows evident signs of wear.
5. Check the tension of the motor drive-belt. Adjust the tension if necessary.

10.3.9. CHECKING THE ELEVATION MOTOR DRIVE-BELT

1. With the machine powered-up, raise it to its maximum incline (15%).
2. Turn off the machine by placing the switch in the 0 position (OFF).
3. Unplug the mains lead from the wall outlet.
4. Remove the guard plate of the elevation motor drive-belt.
5. Check the state of wear of the elevation motor drive-belt. Replace if it shows evident signs of wear.
6. Check the tension of the elevation motor drive-belt. Adjust the tension if necessary.

10.3.10. CHECKING THE SHOCK ABSORBERS

1. Only after having worked on the tread belt and/or running track, check the condition of the shock absorbers on either side of the running track. Replace if they are cracked or show signs of breakage.

10.3.11. CHECKING THE SPEED CALIBRATION

1. Open the motor guard.
2. On the European machine version, check that when the machine runs at a speed of 12.6 km/h the inverter displays a working frequency of 69 Hz.
3. On the US machine version, check that when the machine runs at a speed of 9 mph the inverter displays a working frequency of 79.3 Hz.

WARNING: this must be done with the machine opened and powered up.

10.3.12. CHECKING THE OPERATION OF THE CARDIO RECEIVER

1. Using a separate heart rate monitor, put on the transmitter strap and check that the machine and the separate monitor both measure the same heart rate, and that when the strap is disconnected the machine does not receive any signal.
2. Using a heart rate frequency simulator, check that the machine detects the variations in the heart rate.

3. If the machine is equipped with a coded receiver (PCD technology), put on the coded strap and wait for the machine to display the measured heart rate. At this point, using a heart rate frequency simulator, check that the machine does not detect its presence and doesn't alter the previously measured heart rate.

10.3.13. CHECKING THE OPERATION OF THE HAND SENSOR RECEIVER

1. Using a separate heart rate meter, check that, when the sensors are gripped, both the machine and the separate meter read out the same frequency, and that when the sensors are released the machine does not detect any signal.

11. APPENDIX

11.1. TECHNICAL NOTES ON CARDIO RECEIVERS

Technogym utilizes Polar technology for measuring the heart rate frequency of the person training on the machine. The Polar system consists of:

- a **transmitter**, worn by the person training on the machine, which uses 2 electrodes to detect the electrical activity of the heart and transmits the measured heart rate by sending an electromagnetic signal at a frequency of 5 KHz.

- a **receiver**, shown in the figure below, which consists of:

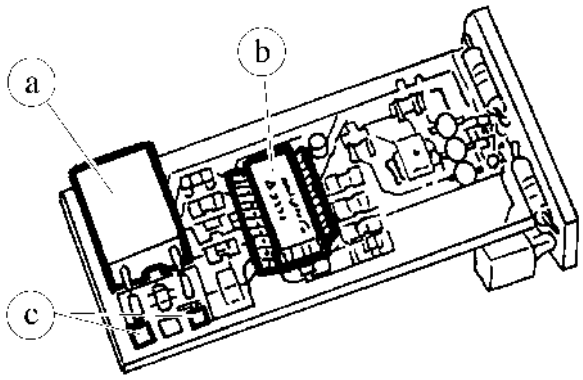


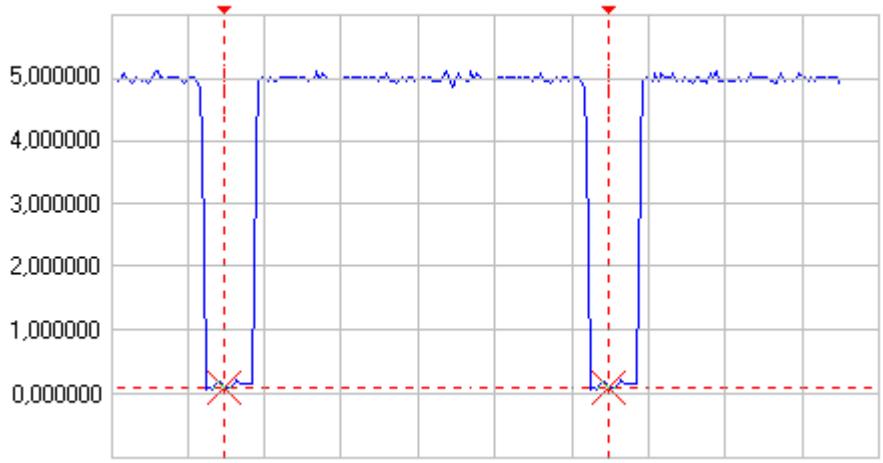
Figure 11.1-1

- 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 receiver is connected to the CPU board by means of 3 wires for:

- +5 Vdc power supply;
- Output signal (heart rate);
- Ground.

The output is a digital signal that is normally at 5 Vdc and goes to 0 Vdc for a few msec when a heart beat is detected, as shown in the figure below.



There are 3 types of problems which can typically occur on the heart rate signal:

- **interference** caused by disturbances from sources of electromagnetic noise. These problems cause the heart rate signal to deviate from the rear value, typically making it higher;
- **saturation** caused by disturbances from sources of electromagnetic noise. In this case the receiver is no longer able to detect any heart rate signal;
- **cross-talk** similar to the interference problem, but is caused by reception of a signal from another strap, typically worn by users on adjacent machines if they are too close together.

The following paragraphs contain various suggestions 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 models, 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.

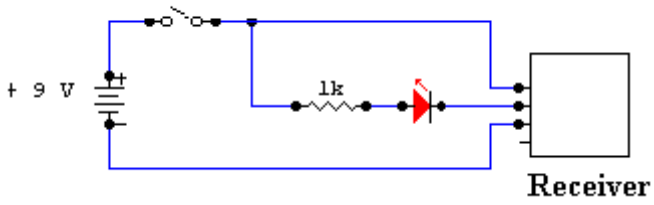
11.1.2. PRESENCE OF ELECTROMAGNETIC FIELDS

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 different forms: on the one hand, the receiver may detect and hence generate spurious transients or periodic noise pulse, 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. The presence of **periodic noise pulse** effect the heart rate signal. **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 noise, 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 parallel 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.

WARNING: if there is already a 15 KOhm resistor mounted in parallel with the coil, note that adding another resistor in parallel will produce 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 impulses. 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.

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, so that it does not pass near the coil;
- the receiver must be directed in such a way that its axis of reception is parallel to that of the transmitter, as shown in the figure below:

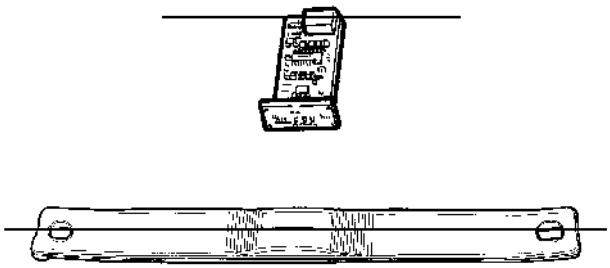


Figure 11.1-2

Please note that even small departures from the above specifications may considerably impair the accuracy of reception.

The optimal configuration is therefore that shown in the figures below:

- receiver housed inside the display:

Figure 11.1-3

- receiver positioned under the display:

Figure 11.1-4

11.1.6. ROUTING OF CABLES

Particular care must be taken in the routing of cables to prevent interference with the receiver coil.

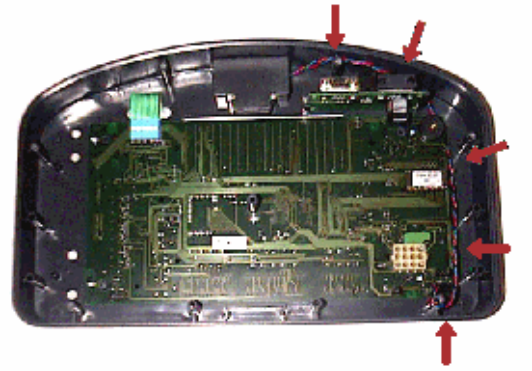


Figure 11.1-5

11.2. PERSONAL CODED DEVICE

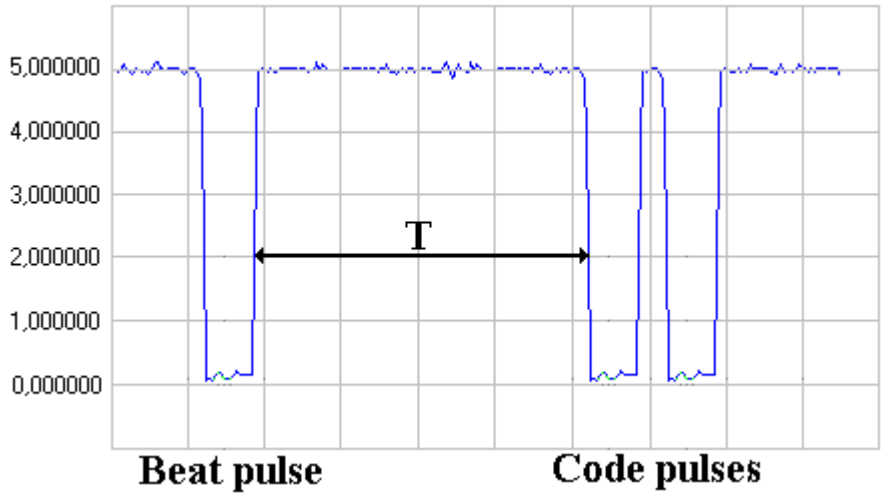
The machine can be equipped with a new heart rate receiver based on the **PERSONAL CODED DEVICE** technology developed exclusively by Technogym in conjunction with POLAR.

Thanks to a special receiver installed on the machine, and using a new "coded" chest strap, the machine receives only the heart rate signal from its own user. This makes it possible to eliminate the cross-talk problems, because each machine is selectively tuned into the heart rate signal transmitted by its user. This new feature translates into a considerable advantage for the health club owner: with the PCD system, it will now be possible to install cardio machines closer together, thereby fitting a greater number of machines into a given floor space area.

This technology is an evolution of the Polar Coded technology, with which it is fully compatible. The PCD system differs from Polar's standard coded technology because it incorporates certain features which ensure a more accurate and precise reception of the heart rate signal.

11.2.1. OPERATING MODES

The new system is based on the fact that the coded strap transmits the user's heart rate signal accompanied by a special transmitter identification code. In fact, when the user puts on a coded strap, the strap randomly selects one of 28 available codes and starts to transmit using that code. The transmitted signal is shown in the figure below:



It should be noted that:

- The transmitter sends the measured heart rate together with another 2 pulses which represent the coding.
- The 2 coding pulses are very close together (20 msec) and separated from the heart rate pulse by a value **T** proportional to the transmission code, according to the table below:

Code	T (msec)
1	35
2	40
3	45
4	50
..	..
27	165
28	170

At the start of the training session, the coded receiver first of all seeks to detect a coded signal for a maximum of 10 seconds. This is done in reduced sensitivity mode to avoid receiving a signal from users on adjacent machines. If no coded signal is found, the receiver searches for a non-coded signal and functions in the traditional manner.

Consequently:

- **If the user wears a "coded" strap and trains on a machine equipped with a Coded receiver**: the machine tunes into the user's heart rate signal and operates in "coded" mode. Synchronization time 3 - 7 seconds maximum.

- **If the user wears a "standard" strap and trains on machine equipped with a Coded receiver**: the machine receives the user's heart rate signal, but does not operate in "coded" mode. Synchronization time 10 - 15 seconds maximum.

  ☞ **If the machines are installed extremely close together, there may be interference problems in reading the user's heart rate signal, as on traditional machines.**

- **If the user wears a "coded" strap and trains on a machine equipped with a "standard" receiver**: the machine receives the user's heart rate signal, but does not operate in "coded" mode. Synchronization time 3 - 7 seconds maximum.

- **If the user wears a "standard" strap and trains on a machine equipped with a "standard" receiver**: this is the old operating mode of the machines.

☞ **WARNING: please note that the PCD system is based on the existing technology, with the addition of the code signal. Therefore, this system can resolve problems of interference in reading the user's heart rate but not those relating to saturation of the receiver in environments with very high levels of electromagnetic disturbance.**

11.3. HITACHI SJ100 INVERTER ERROR CODES

The inverter memorizes all the errors detected during operation, in the form of a code which indicates the cause of the error. The table below lists the error codes and their meaning, as referred to in chapter 6.

DESCRIPTION	CAUSES		ERR.
Power circuits protection	A short-circuit on an inverter output or a motor block causes a high current to flow, generating this error. If the current or temperature of the principal components exceeds a preset threshold, the output is disconnected.	Constant speed	E01
		Deceler.	E02
		Acceler.	E03
		Stop	E04
Overload protection	When the internal thermostat of the inverter detects a motor overload, the output is disconnected.		E05
Braking resistor overload	When the external resistor is used too frequently, and an overvoltage is detected caused by interruption of the BRD function, the output is disconnected.		E06
Overvoltage protection	When the voltage exceeds a preset threshold, due to motor regeneration phenomena, this safety is tripped and the output is disconnected.		E07
EEPROM error	When an error is detected on the EEPROM memory which stores the working program, the output is disconnected.		E08
Low voltage protection	A drop in the input voltage below 150-160 V triggers this error, and the output is disconnected.		E09
CT error	When a major noise source is situated near the inverter, or there is a malfunction in the internal current transducer circuit, the output is disconnected.		E10
CPU error	If a malfunction is detected in the internal CPU, the output is disconnected.		E11
			E22
External shutdown	One of the motor thermal cutouts has opened, the inverter has detected it and disconnected the output.		E12
USP error	Appears if the inverter is turned on with the start key pressed (non in use on RunXTPRO).		E13
Ground short circuit protection	If one of the inverter phases has a leak or short-circuit to ground, the output is disconnected.		E14
Overvoltage protection	If the input voltage increases more than 10% above its nominal value for at least 100 seconds, this safety is tripped and the output is disconnected.		E15
Thermal cutout	If the temperature sensor inside the inverter detects an overtemperature condition, the output is disconnected. In this condition, the dissipator reading is 80 °C.		E21
PTC error	Problem with the PTC sensor (not used on Forma).		E35

To display the inverter error codes, follow the instructions below or refer to pages 8-2 of the inverter manual:

1. Remove the motor guard.

2. Turn on the machine.
3. Repeatedly press the “1” or “2” key on the inverter keypad until the display shows “d08”.
4. Press the “FUNC” key to display the last error which occurred. The following will sequentially appear:

   - error code;
   - output frequency when the error occurred;
   - motor current when the error occurred;
   - motor voltage when the error occurred;

   To advance to the next value, press the “FUNC” key.

5. To view the last 2 logged errors in inverse chronological order, display the function “d09”and press the “FUNC” key. Each time this key is pressed the inverter memory goes back one error.

ATTENTION: Be very careful not to touch any other keys, or to touch the aforesaid keys at the wrong time, as this can seriously damage the inverter configuration, leading to malfunctioning of the machine.

11.4. PROCEDURE FOR CLEARING THE ERROR MEMORY ON HITACHI SJ100 INVERTER

For all Hitachi SJ100 inverters, it is available an easy procedure for clearing the error memory. To do this:

1. Turn on the machine;
2. Configure parameter **b84** = **00**;
3. Come back to the visualization of the parameter **b84** and press simultaneously the keys **FUNC**, ↑, ↓;
4. Holding down the three keys, press also **Stop/Reset** key for about 1 second and wait for about 3 seconds, until the blinking **d00** is shown on the display.
5. Now release all keys again. The initializing phase that now begins will be complete as soon as the display **00** appears. The errors' memory now will be clear.

11.5. PROCEDURE FOR CLEARING PARAMETERS ON HITACHI SJ100 INVERTER

For all Hitachi SJ100 inverters, it is available an easy procedure for resetting parameters to the factory setting. To do this:

1. Turn on the machine;
2. Configure parameter **b85** = **01**;
3. Configure parameter **b84** = **01**;
4. Come back to the visualization of the parameter **b84** and press simultaneously the keys **FUNC**, ↑, ↓;

5. Holding down the three keys, press also **Stop/Reset** key for about 1 second and wait for about 3 seconds, until the blinking **d00** is shown on the display;
6. Now release all keys again. The initializing phase that now begins will be complete as soon as the display **00** appears. The parameters will be reset to the factory setting.

11.6. HITACHI J100 INVERTER ERROR CODES

The inverter memorizes all the errors detected during operation, in the form of a code which indicates the cause of the error. The table below lists the error codes and their meaning, as referred to in chapter 6.

DESCRIPTION	CAUSES		ERR.
Power circuits protection	A short-circuit on an inverter output or a motor block causes a high current to flow, generating this error. If the current or temperature of the principal components exceeds a preset threshold, the output is disconnected.	Constant speed	E1
		Deceler.	E2
		Acceler.	E3
		Stop	E4
Overload protection	When the internal thermostat of the inverter detects a motor overload, the output is disconnected.		E5
Braking resistor overload	When the external resistor is used too frequently, and an overvoltage is detected caused by interruption of the BRD function, the output is disconnected.		E6
Overvoltage protection	When the voltage exceeds a preset threshold, due to motor regeneration phenomena, this safety is tripped and the output is disconnected.		E7
EEPROM error	When an error is detected on the EEPROM memory which stores the working program, the output is disconnected.		E8
Low voltage protection	A drop in the input voltage below 150-160 V triggers this error, and the output is disconnected.		E9
CT error	When a major noise source is situated near the inverter, or there is a malfunction in the internal current transducer circuit, the output is disconnected.		E10
CPU error	If a malfunction is detected in the internal CPU, the output is disconnected.		E11
External shutdown	One of the motor thermal cutouts has opened, the inverter has detected it and disconnected the output.		E12
USP error	Appears if the inverter is turned on with the start key pressed (non in use on RunXTPRO).		E13
Ground short circuit protection	If one of the inverter phases has a leak or short-circuit to ground, the output is disconnected.		E14

To display the inverter error codes, follow the instructions below or refer to pages 8-14 of the inverter manual:

1. Remove the motor guard.
2. Turn on the machine.
3. Repeatedly press the “FUNC” key on the inverter keyboard until “ERR” appears.
4. Press the “1” key to display the last error saved. For each error, three different values are alternately displayed:

   - The error code.
   - Current at the time of the error.

- Voltage at the time of the error (this is the DC voltage internal to the inverter; to obtain the actual mains voltage simply divide this value by 0.14).

5. To proceed to display all the errors in reverse chronological order, simply press the "1" key while the error code is being displayed. Each time this key is pressed, the display will go back by one error in the inverter memory.

ATTENTION: Be very careful not to touch any other keys, or touch the aforesaid keys at the wrong time, as this can seriously damage the inverter programming, with consequent malfunctioning of the machine.

11.7. PROCEDURE FOR CLEARING THE ERROR MEMORY ON HITACHI J100 INVERTER

For all Hitachi J100 inverters, starting from and including series E3, there is an easy procedure for clearing the error memory. To do this:

1. Turn on the machine;
2. Configure parameter **A57** = **1**;
3. Turn off the machine;
4. Wait a few minutes, then turn the machine back on.

This procedure clears the error memory.

WARNING: set the A57 parameter back to 0 in order to continue logging future errors.

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