

SportsArt_{FITNESS}

TR31/TR32/TR33 Treadmill Repair Manual



SPORTS ART INDUSTRIAL CO., LTD.

Version1 2007/03/21



TR31/TR32/TR33 Treadmill Repair Manual

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Made through the cooperation of SportsArt Industrial Co., Ltd., Tainan, Taiwan, and SportsArt Fitness, Woodinville, WA, USA.

For suggestions or comments, please contact Bob Baumgartner at bob@sportsartamerica.com. Thank you.

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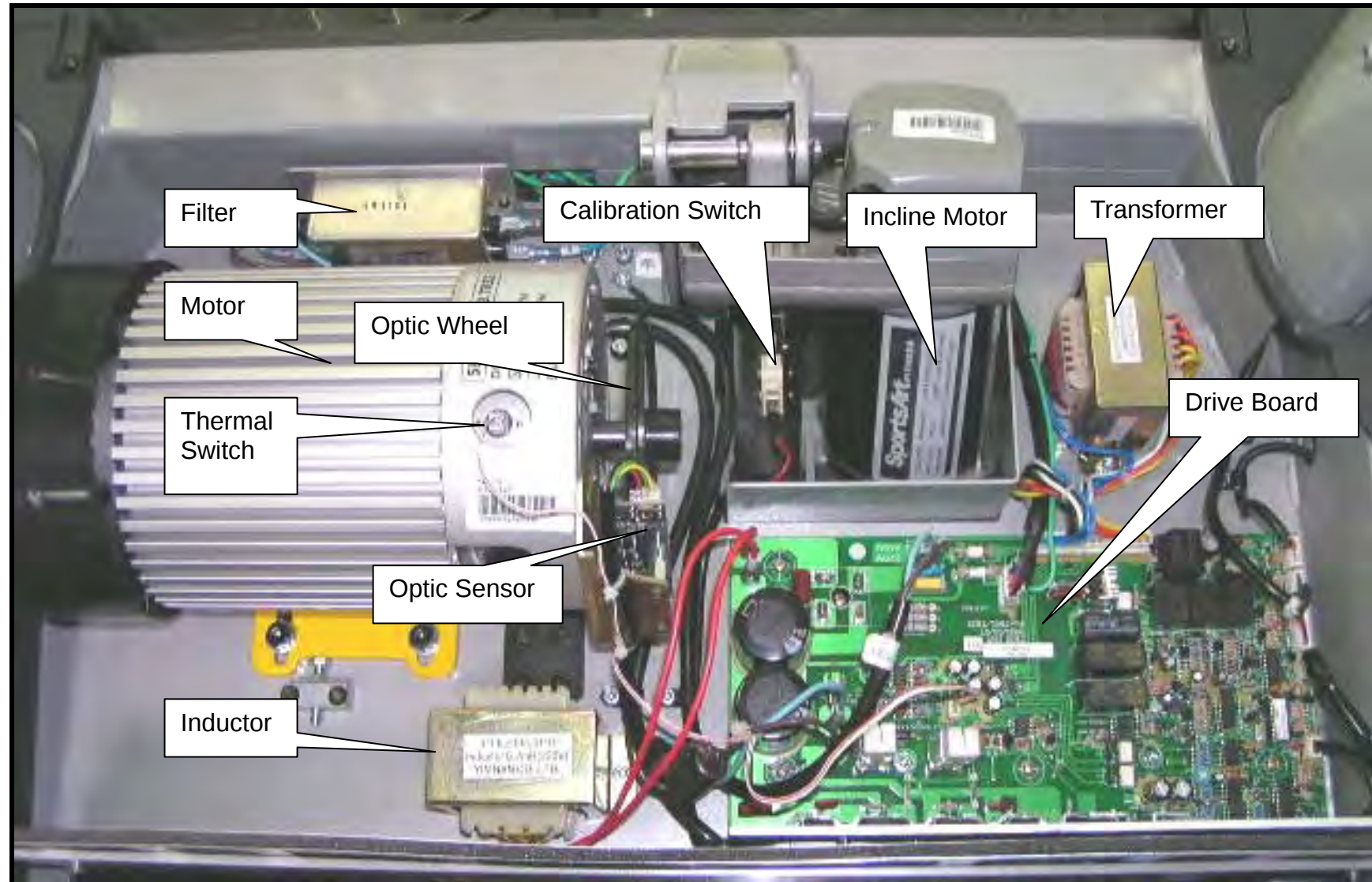
TR33 Illustration



TR33 Components - Display Area



TR31/TR32/TR33 Components - Motor Area



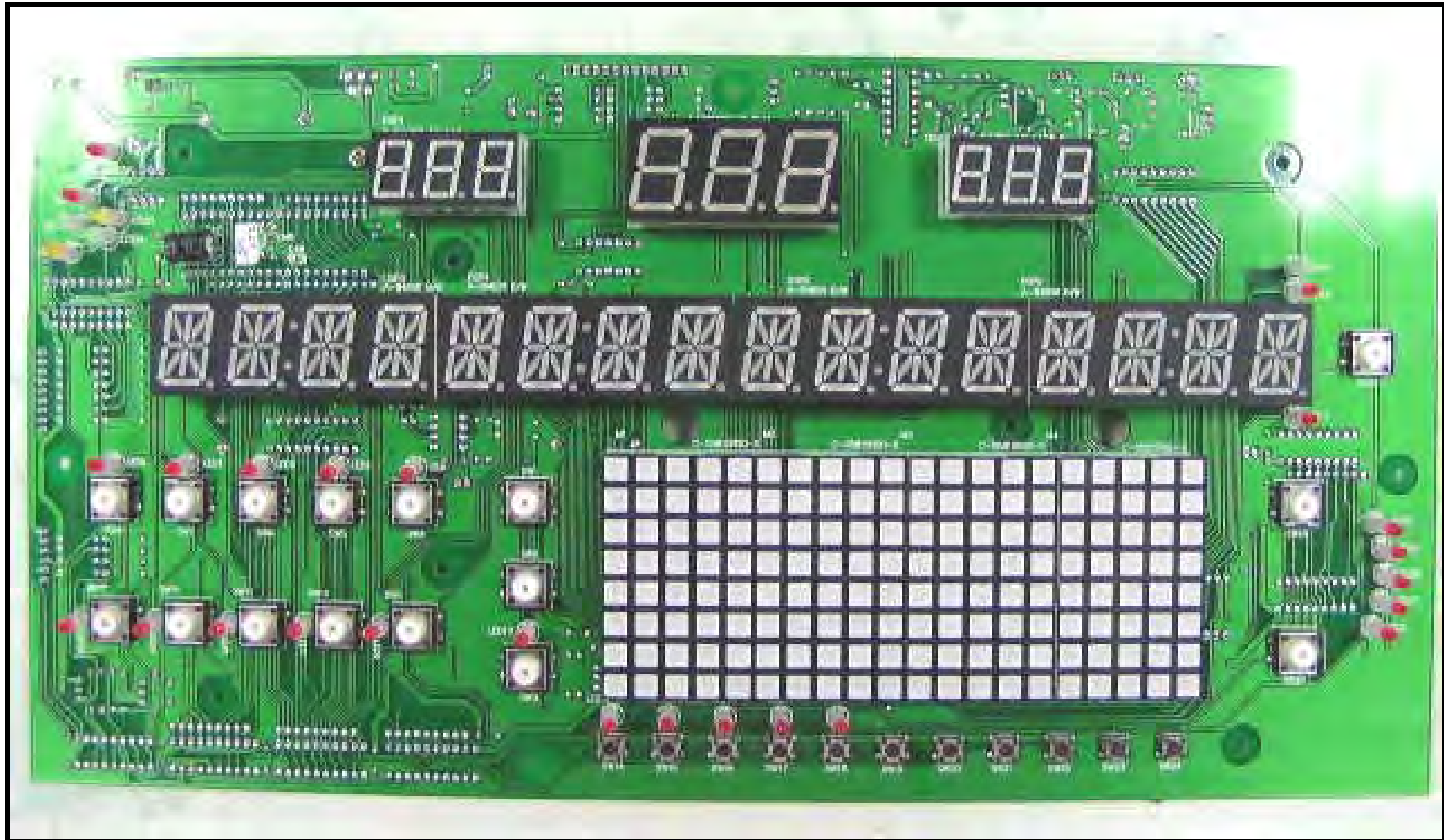
TR33 Display Illustration



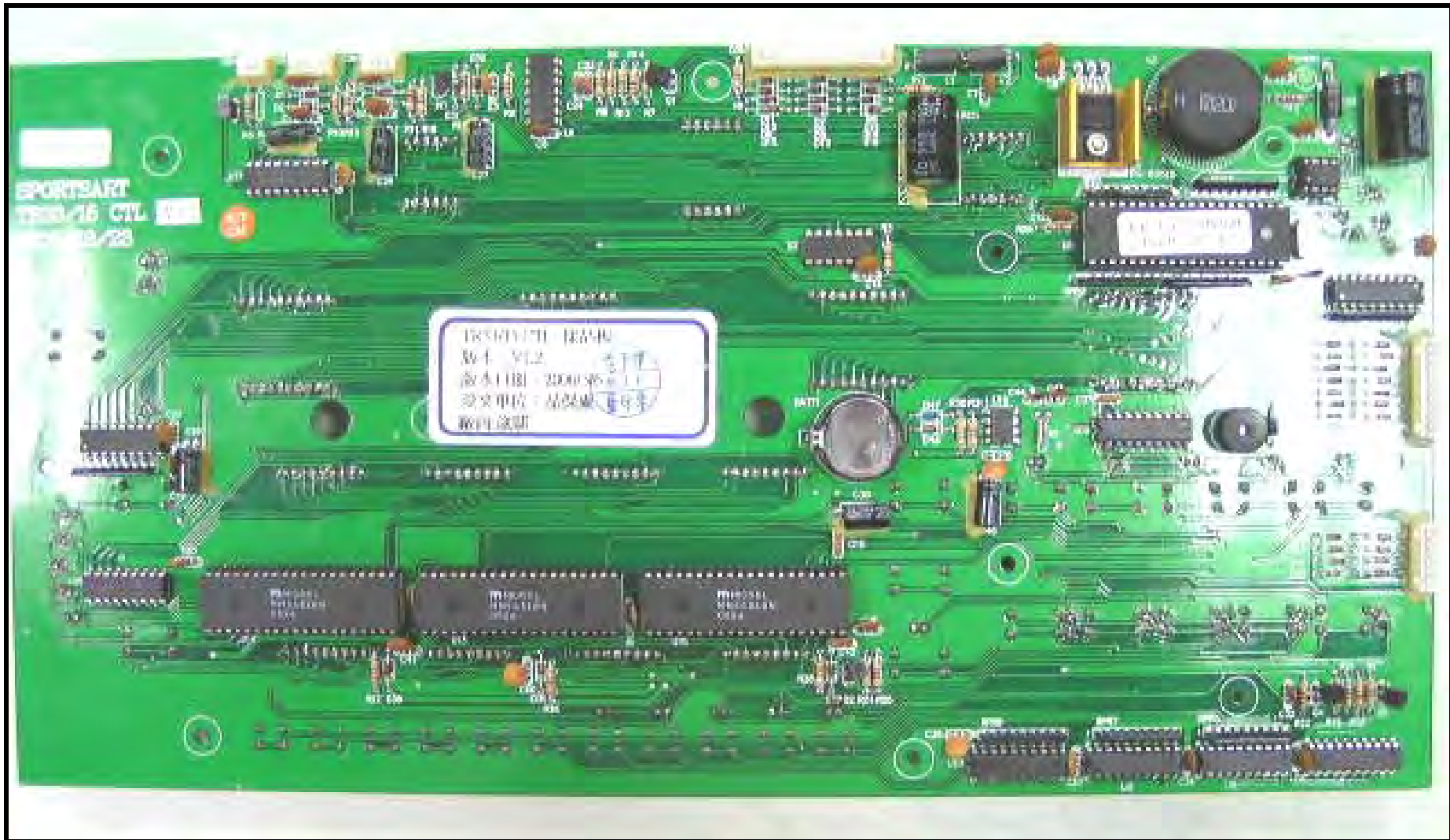
TR31/TR32 Display Illustration



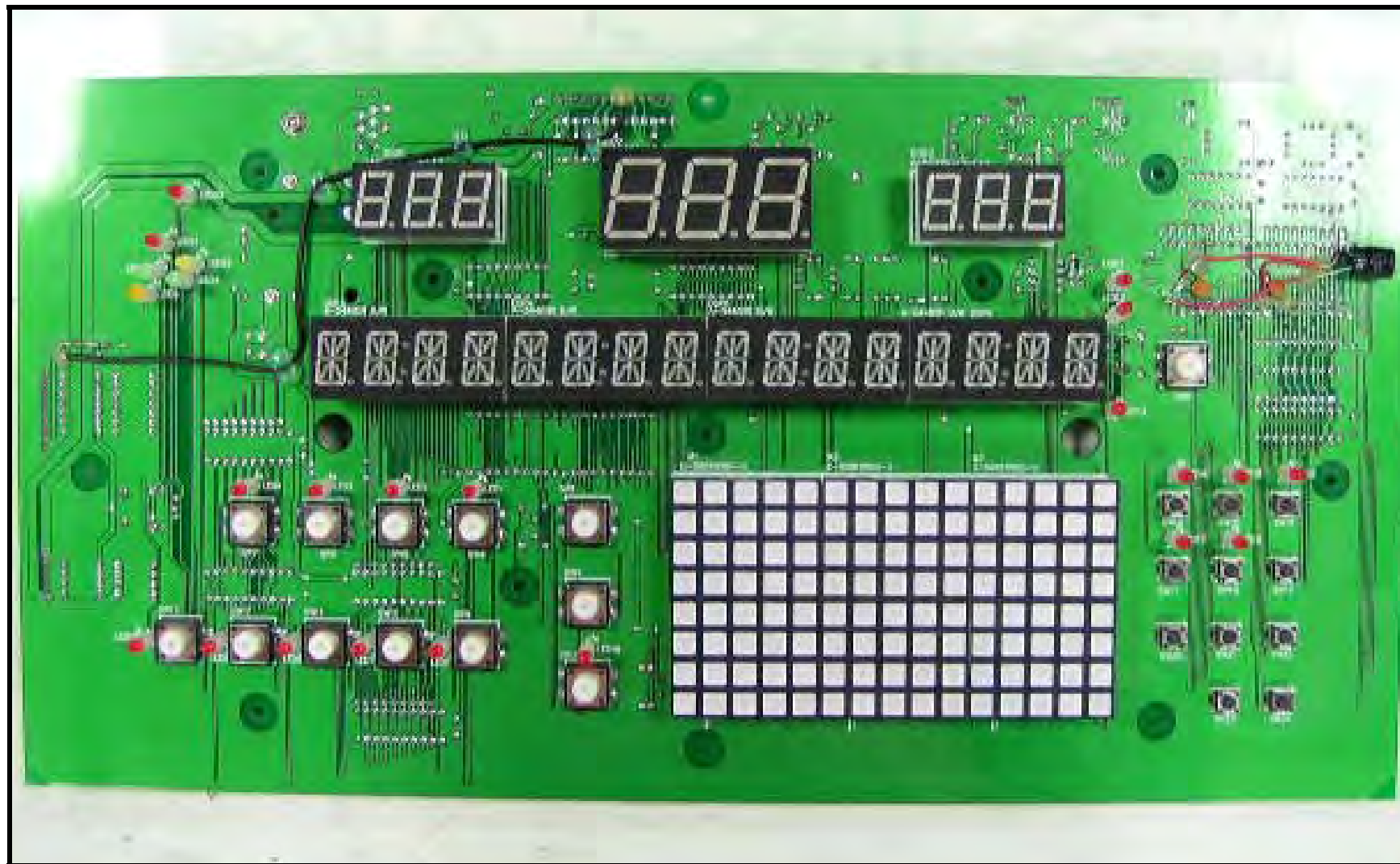
TR33 Display Components – Display Board (Front)



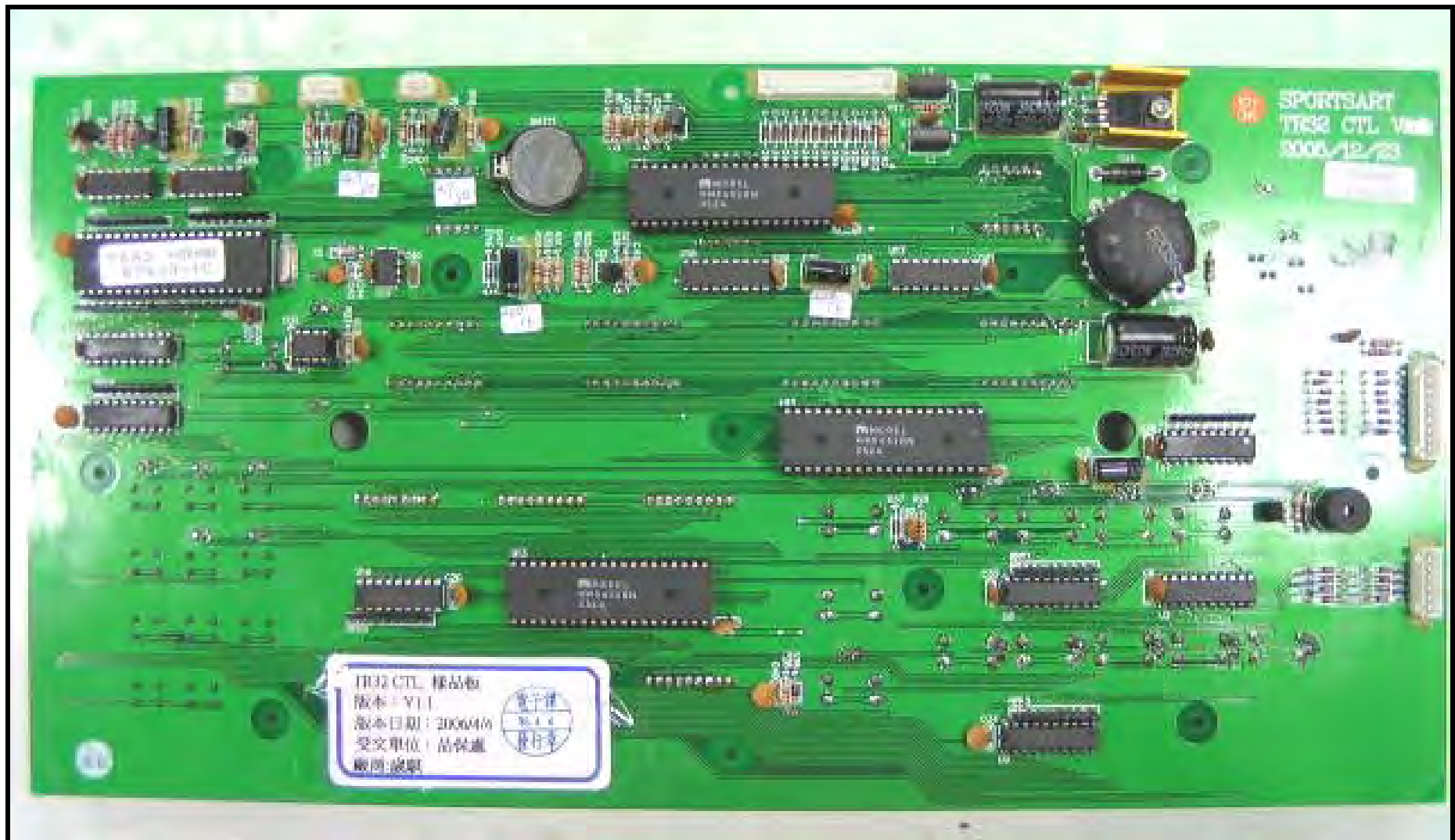
TR33 Display Components – Display Board (Back)



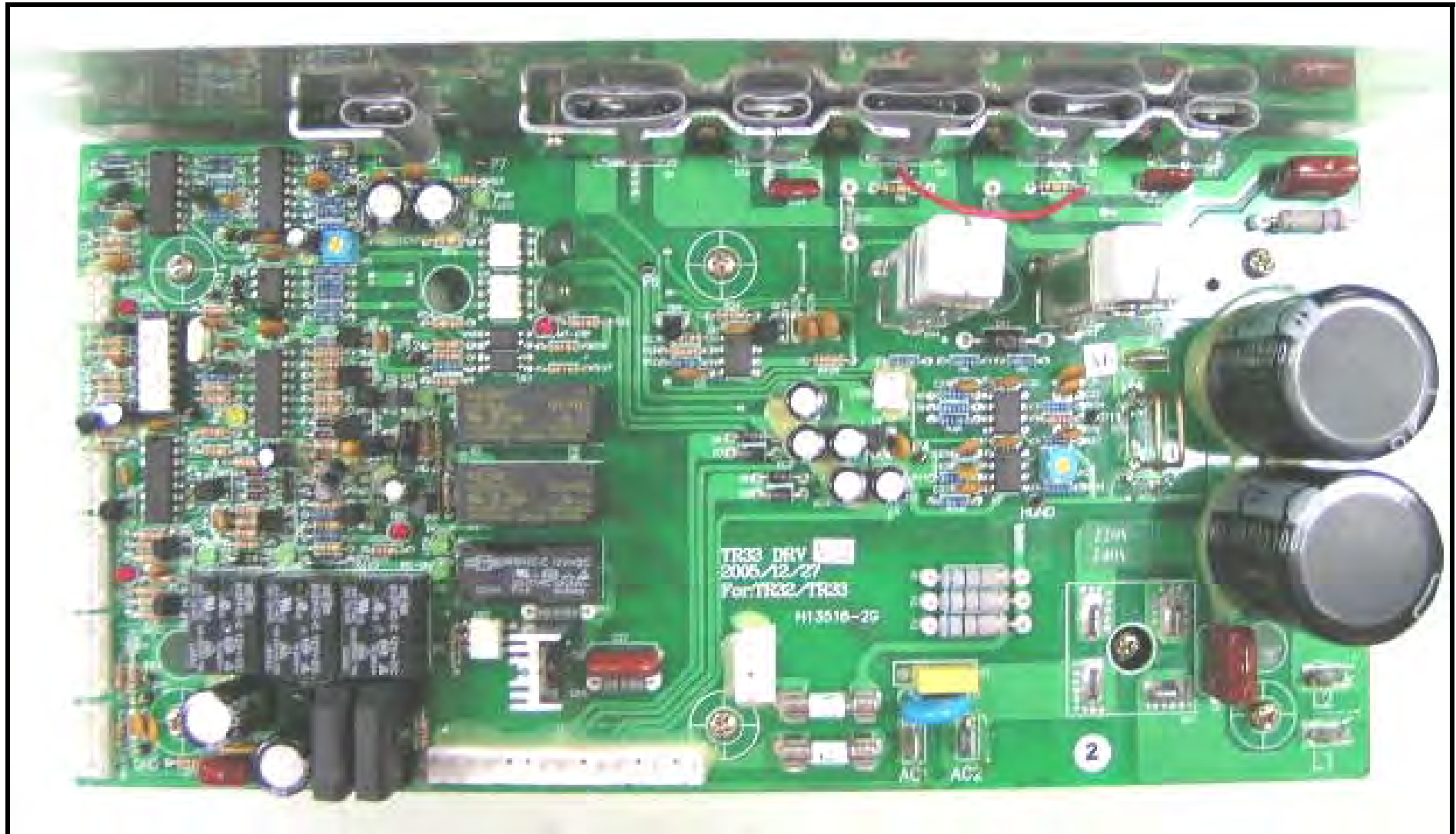
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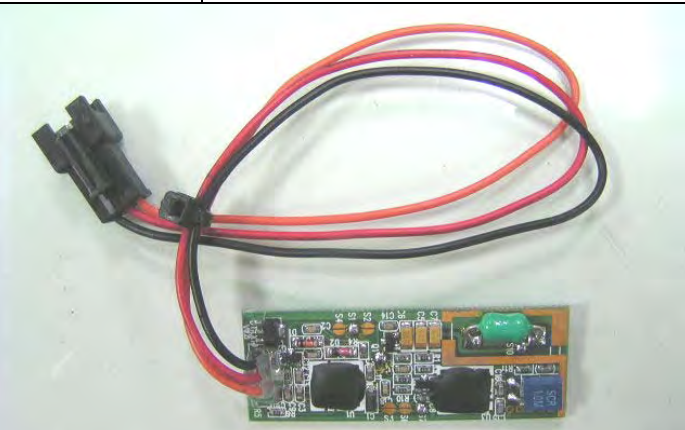
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TR31/TR32/TR33 Drive Board Components



TR31/TR32/TR33 Display Components - Other

Part	Key Circuit Board	Part	Optic Sensor
 A green printed circuit board (PCB) for the key circuit. It features several push buttons labeled 'FAN', 'STOP', 'INCL-UP', 'INCL-DN', 'SPEED-UP', and 'SPEED-DN'. There is also a 'QUICK START' button and a 'CON' connector. The board is marked with 'H12712B' and 'SPORTSART'. A label on the bottom left reads: 'TR33KEY V1.1', '2005/11/02', 'FOR : TRXX SERIALS'.		 A green PCB for the optic sensor. It features two circular optical sensors and a 'CON' connector. The board is marked with 'SPORTSART' and a label that reads: 'SPORTS ART', '3100INT US,0', '2001/05/14', 'FOR :', '3200, 3250, 6005', '3007, 31XX'.	
Part	Fan Control Board	Part	HRC Board
 A green PCB for the fan control board. It features a large black fan, various electronic components like resistors, capacitors, and a microcontroller. The board is marked with 'H12712B' and 'SPORTSART'.		 A small green PCB for the HRC board. It features a microcontroller, various electronic components, and a cable with a black connector and red, black, and white wires.	

TR31/TR32/TR33 Electronic Components - Other

Part	HTR Circuit Board	Part	Filter
			

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Chapter 2

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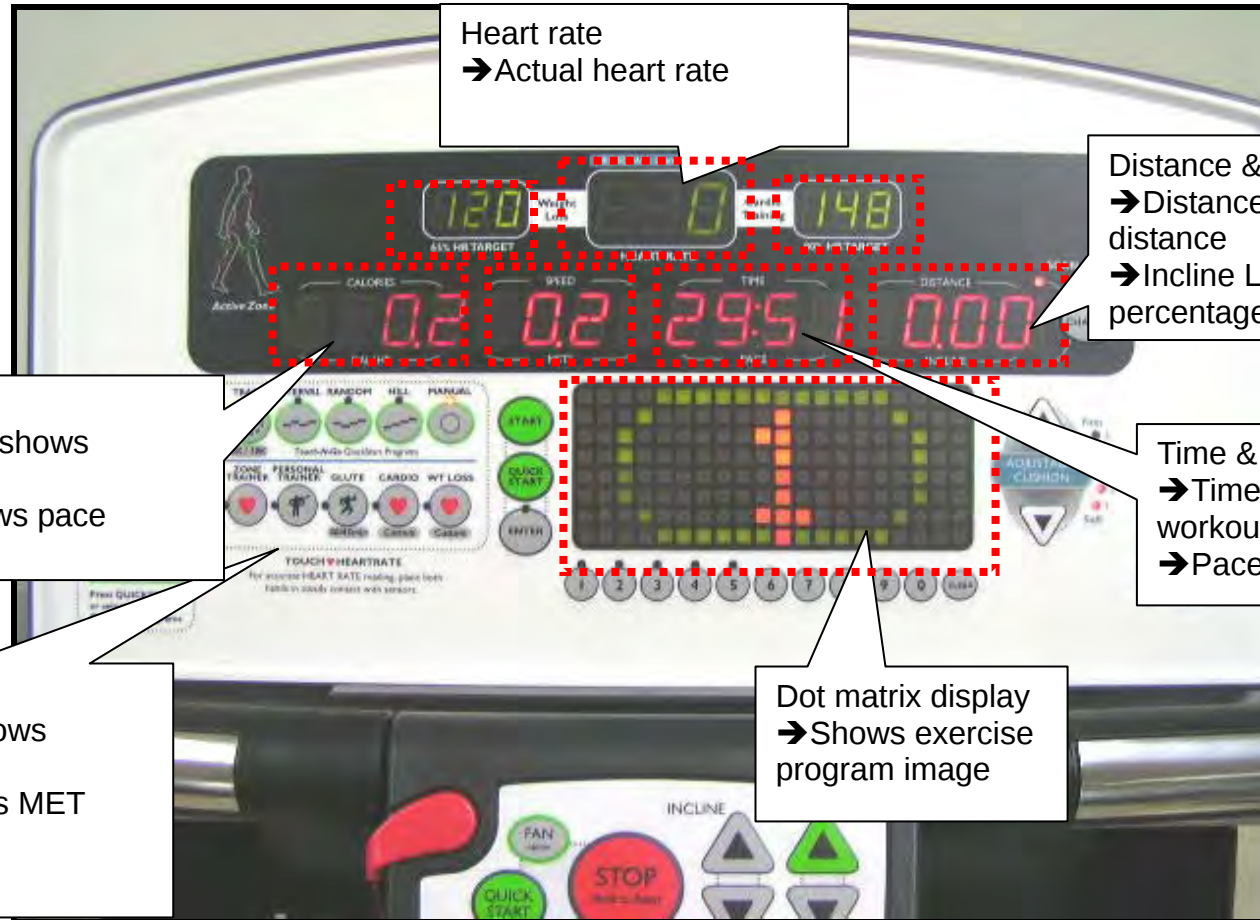
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TR33 Specifications

Item	Specifications	Notes
Power	Exterior power supply 110V (N. America); 220V (Europe)	
Main screen	Target Heart Rate: 65%, 80%; (Actual) Heart Rate Calories , Speed , Time , Distance , Cal/hr , Mets , Pace , Incline	
Secondary image screen	Dot matrix screen 15 X 8	
Speed range	0.2 - 20.0 KPH or 0.1 – 12.0 MPH	
Incline range	0% to 15%	AC motor program control
Heart rate functions	Heart Touch Rate (HTR) grip Wireless Telemetry Heart Rate Reception	
KPH/MPH settings	Determined through programming protocol	
Fan	Off, low-, medium-, high-speed settings	
Operating Modes	Track , Manual , Hill , Random , Interval TRACK, WT Loss ,Cardio , Glute, Zone Trainer , Personal Trainer	
Cushion	Power adjust cushion control on TR33	

TR33 Display Functions



Heart rate
→ Actual heart rate

Distance & Incline
→ Distance LED lit – shows distance
→ Incline LED lit – shows incline percentage

Calories & Cal/HR
→ Calories LED lit – shows calories burnt
→ Pace LED lit – shows pace

Time & Pace
→ Time LED lit – shows workout duration
→ Pace LED lit – shows pace

Speed & Met
→ Speed LED lit – shows present speed
→ Met LED lit – shows MET value

Dot matrix display
→ Shows exercise program image

TR33 Indicator LEDs

Active zone

→ Lights to show areas of the body being exercised

Exercise mode indicators

→ Light to indicate exercise modes: Track, Interval, Random, Hill, Manual, Zone Trainer, Personal Trainer, Glute, Cardio, WT Loss

Display change indicator

→ Lights to indicate display mode

Cushion indicators

→ Light to show degree of cushion



TR33 Display Key Functions

< TRACK > < INTERVAL >
 < RANDOM > < HILL >
 < MANUAL > < ZONE >
 < TRAINER > < PERSONAL >
 < TRAINER > < GLUTE >
 < CARDIO > < WT LOSS >
 → Press to select an exercise mode.

< START > < QUICK START >
 < ENTER >
 → Press < START > to exercise after inputting information; Press < QUICK START > to immediately start exercising; Press < ENTER > to confirm your choice.

< FAN >
 → Press to control fan functions.

< QUICK START >
 → Press to immediately begin exercising.

STOP
 → Press to stop belt movement.

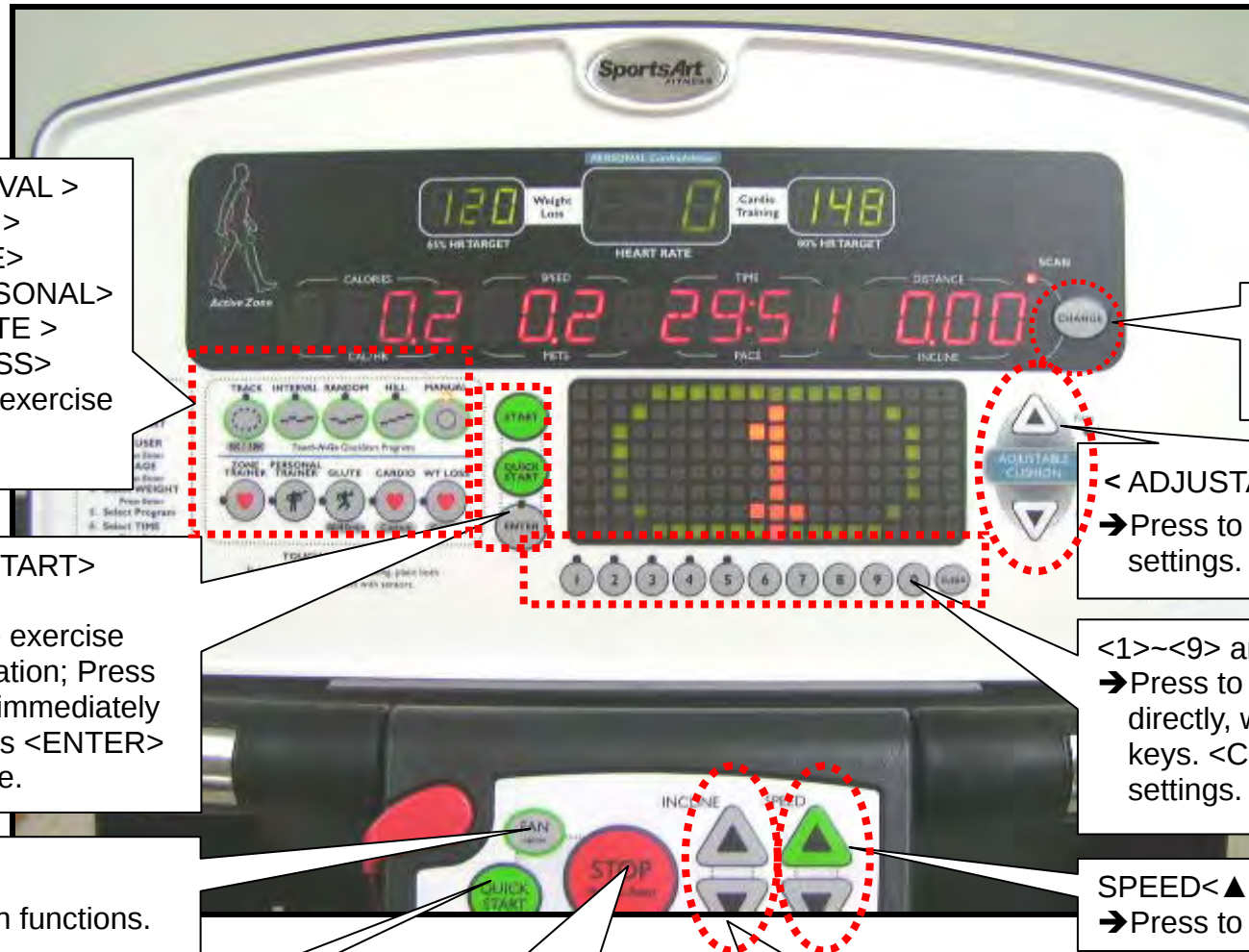
INCLINE < ▲ > / < ▼ >
 → Press to change incline level.

< CHANGE >
 → Press to change display modes.

< ADJUSTABLE CUSHION >
 → Press to change cushion settings.

< 1 > ~ < 9 > and < CLEAR >
 → Press to input numbers directly, without using ▲ ▼ keys. < CLEAR > cancels settings.

SPEED < ▲ > / < ▼ >
 → Press to set walk belt speed.



TR31/TR32 Specifications

Item	Specifications	Notes
Power supply	Exterior 110V (N. America); 220V (Europe)	
Main function window	Target Heart Rate: 65%, 80%; (Actual) Heart Rate, Calories, Speed, Time, Distance, Cal/hr, Mets, Pace, Incline	
Exercise illustration window	Dot matrix screen 15 X 8	
Speed	0.2 - 20.0 KPH or 0.1 – 12.0 MPH	
Incline	0% to 15%	AC motor program control
Heart rate	Heart Touch Rate (HTR) grip Wireless Telemetry Heart Rate Transmitter	
KPH/MPH	Determined through programming protocol	
Fan	Off, low-, medium-, high-speed settings	Optional accessory available for purchase in N. America
Exercise modes	Manual, Hill, Random, Interval, WT Loss, Cardio, Glute, Personal Trainer, Zone Trainer	
Cushion	Manual adjust cushion control on TR32; No cushion adjustment on TR31	

TR31/TR32 Display Functions

Heart rate 65%
→ Optimum heart rate for weight loss

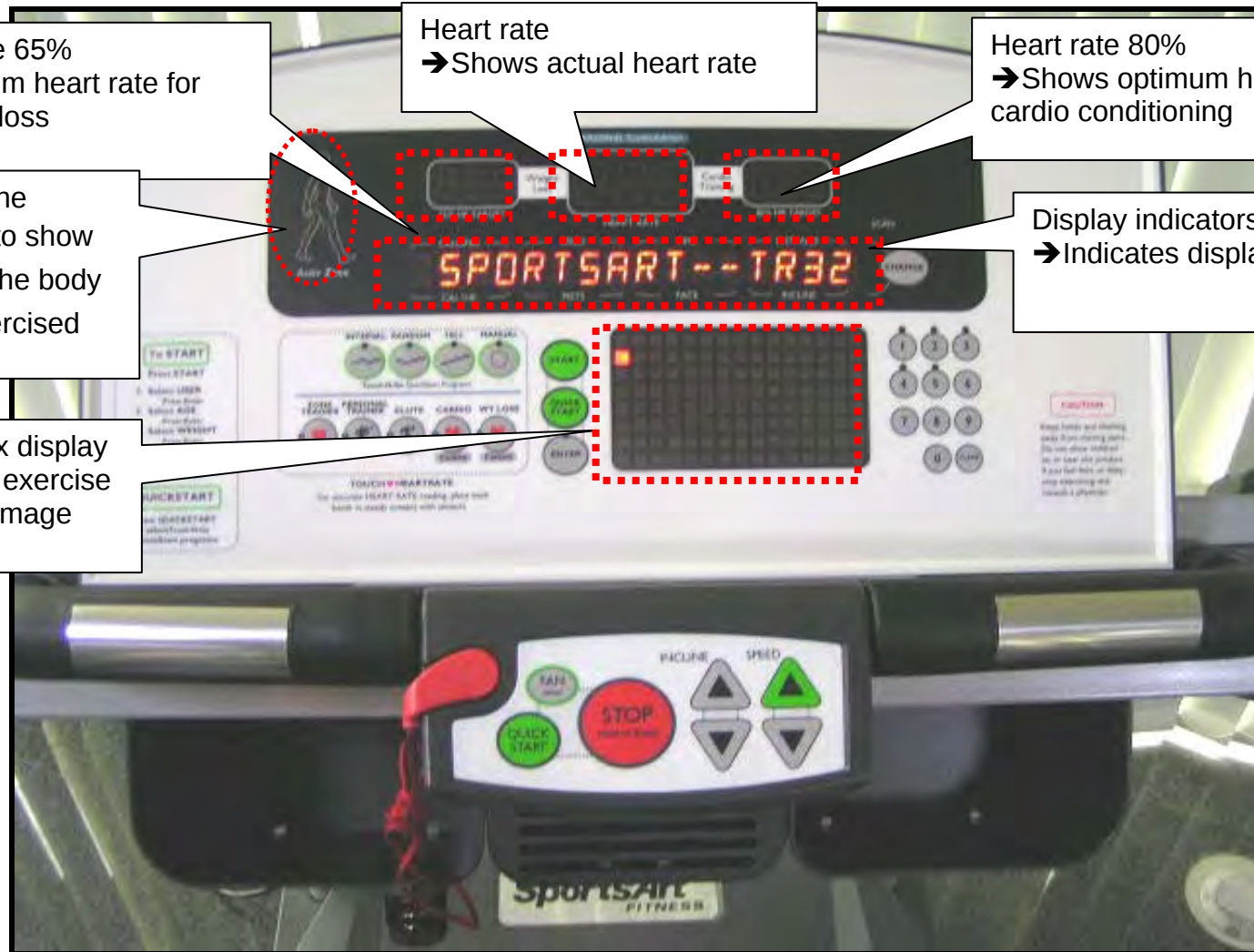
Heart rate
→ Shows actual heart rate

Heart rate 80%
→ Shows optimum heart rate for cardio conditioning

Active zone
→ Lights to show areas of the body being exercised

Display indicators
→ Indicates display mode

Dot matrix display
→ Shows exercise program image



TR31/TR32 Indicator LEDs

Calories & Cal/HR

- Calorie LED lit—shows calories burnt
- Cal/HR LED lit—shows calorie burn per hour

Time & Pace

- Time LED lit—shows time
- Pace LED lit—shows pace

Speed & Mets

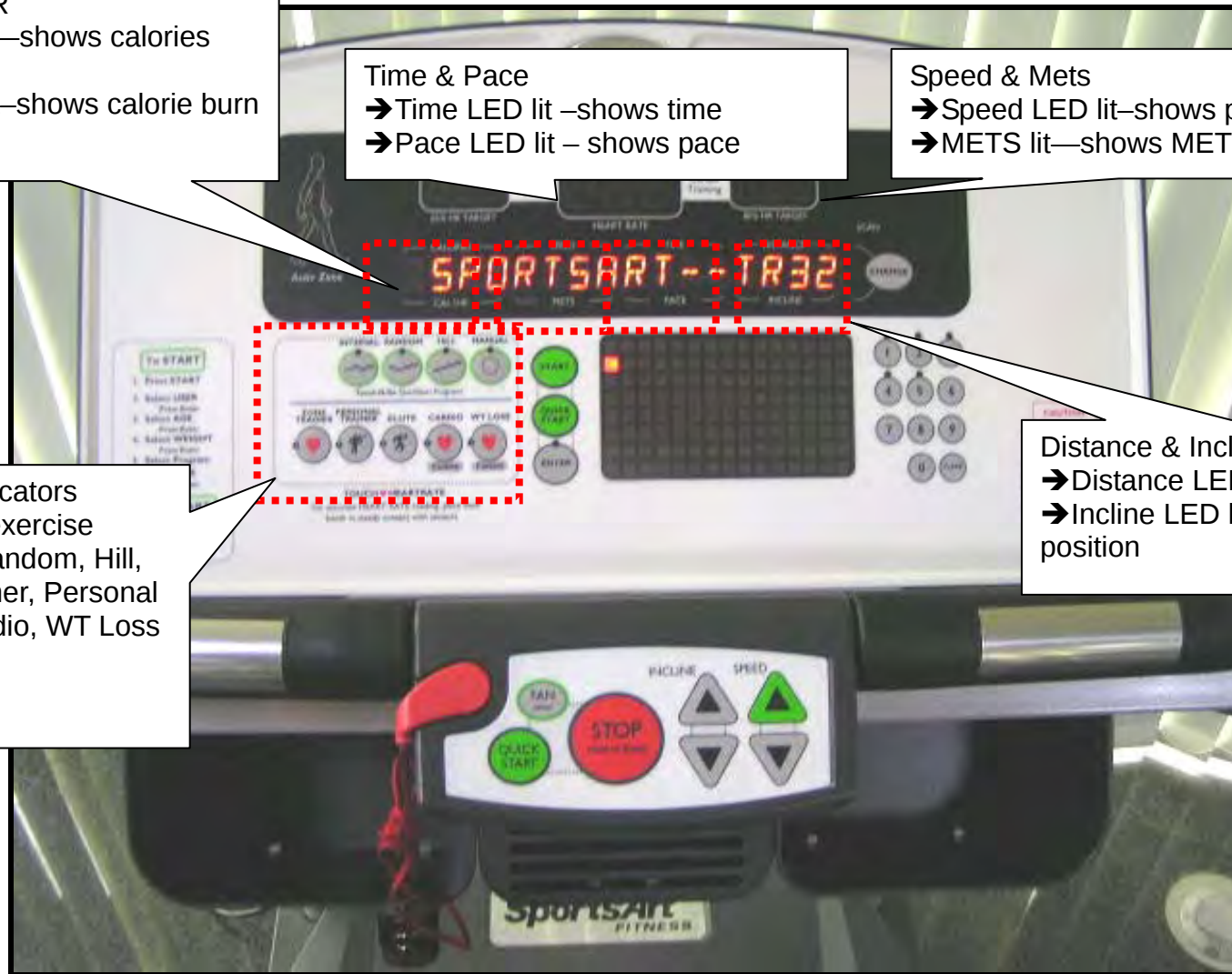
- Speed LED lit—shows present speed
- METS lit—shows MET

Exercise mode indicators

- Lights to show exercise modes: Interval, Random, Hill, Manual, Zone Trainer, Personal Trainer, Glute, Cardio, WT Loss

Distance & Incline

- Distance LED lit—shows distance
- Incline LED lit—shows incline position



TR31/TR32 Display Key Functions

<START> <QUICK START> <ENTER>
 → Press <START> exercise after inputting information; Press <QUICK START> to immediately start exercising; Press <ENTER> to confirm your choice.

<CHANGE>
 → Press to change display modes.

< INTERVAL > < RANDOM >
 < HILL > < MANUAL > < ZONE
 TRAINER > < PERSONAL
 TRAINER > < GLUTE >
 <CARDIO> <WT LOSS>
 → Press to select an exercise mode.

<1>~<9> and <CLEAR>
 → Press to input numbers directly, without using ▲ ▼ keys. <CLEAR> cancels settings.

< FAN >
 → Press to control fan functions.

< QUICK START >
 → Press to immediately start exercising.

< STOP >
 → Press to stop belt movement.

INCLINE<▲>/<▼>
 → Press to change incline level.

SPEED<▲>/<▼>
 → Press to set walk belt speed.

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Chapter 3

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TR31/TR32/TR33 Start Key Functions: User and Age

To establish USER 1 through USER 4:

1. Press the START key. The display shows "USER-X" to indicate the user setting. See Fig. 1.
2. Press INCLINE $\blacktriangle$ / $\blacktriangledown$ or the numerical keypad to select a user number.

Then press $\blacktriangle$ / $\blacktriangledown$ to confirm your choice.

3. User setting range: USER1~USER4.

To establish User Age:

1. The display shows "AGE-XX" to indicate the age setting. See Fig. 2.
2. Press INCLINE $\blacktriangle$ / $\blacktriangledown$ to set the age. Then press $\blacktriangle$ / $\blacktriangledown$ to confirm your setting.
3. Age setting range: 10~90.

Fig. 1

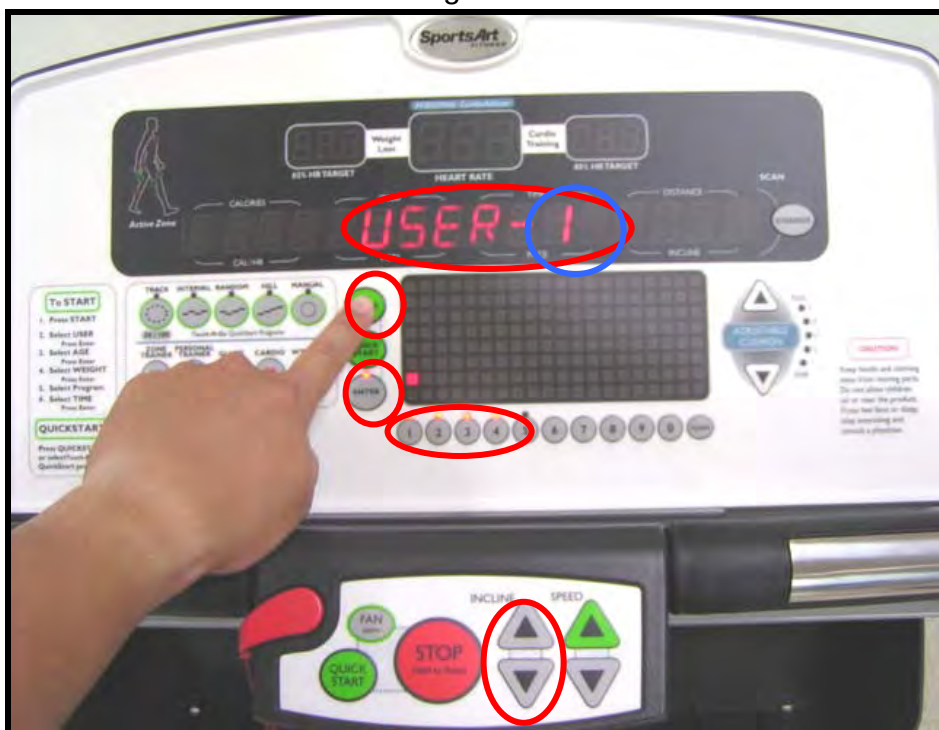
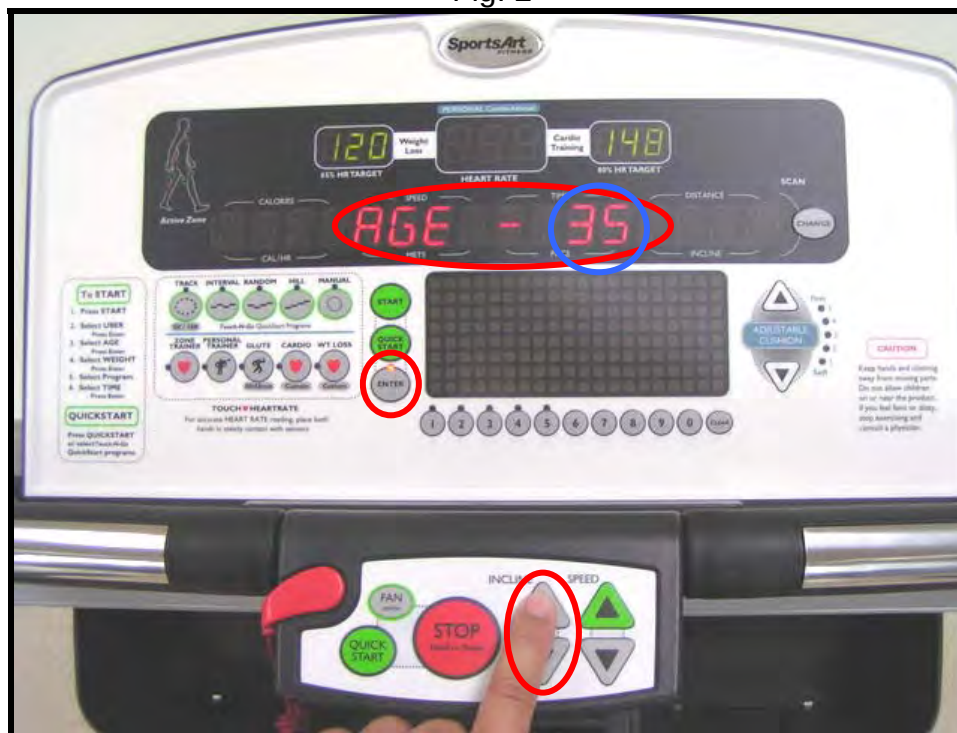


Fig. 2



<START> Key Functions: Weight and Program

To set user Weight:

1. The display shows "WEIGHT-XX KG" to indicate entry into the weight setting. A weight appears, as shown in Fig. 1.
2. Press the INCLINE $\blacktriangle$ / $\blacktriangledown$ key to set the weight. Then press < ENTER > to confirm your choice.
3. Weight range: 20~140 Kg or 50~400 LB.

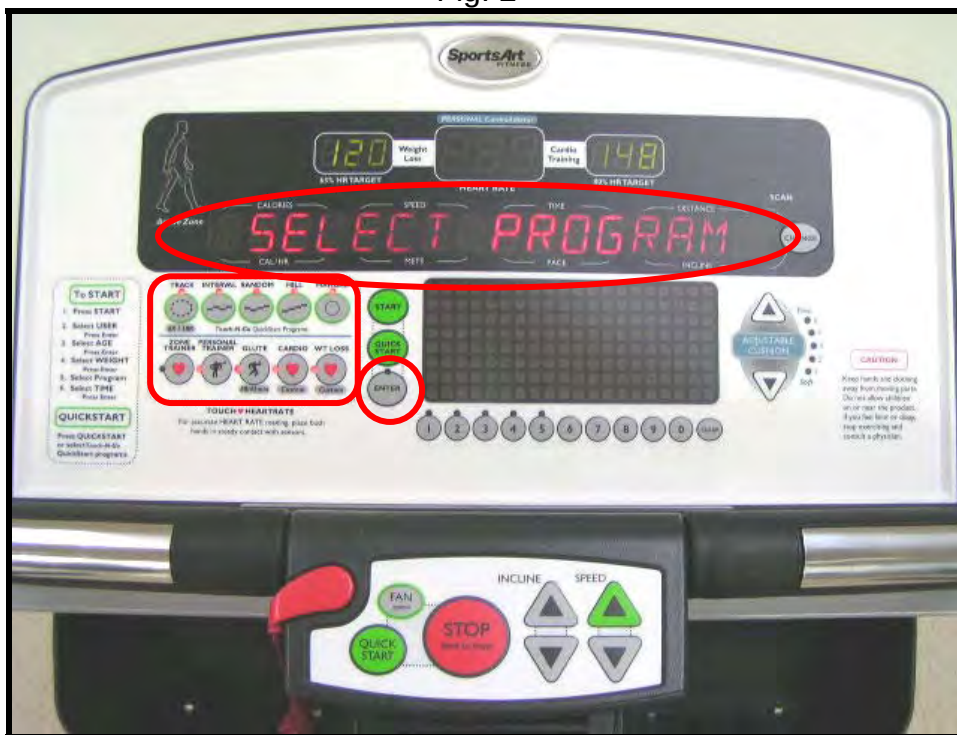
To select a Program:

1. The display shows "SELECT PROGRAM" to indicate entry to program mode. See Fig. 2.
2. Press the PROGRAM key to choose a program mode. Press < ENTER > to confirm your choice.
3. Programs include MANUAL, HILL, RANDOM, INTERVAL, TRACK.

Fig. 1



Fig. 2



<START> Key Functions: Time and Distance Settings

To establish Time and Distance settings:

1. When the display shows "TIME-1" or "DIST-2" you have entered the time or distance setting. See Fig. 1.
2. Press INCLINE <▲> / <▼> keys or numerical keys to input your time or distance goal. Then press <ENTER> to confirm your choice. See Fig. 2.
3. TIME range: 0:00~99:59; DIST range: 0.01~9999Km/Mile.

Fig. 1



Fig. 2



<START> Key Functions: Speed Setting

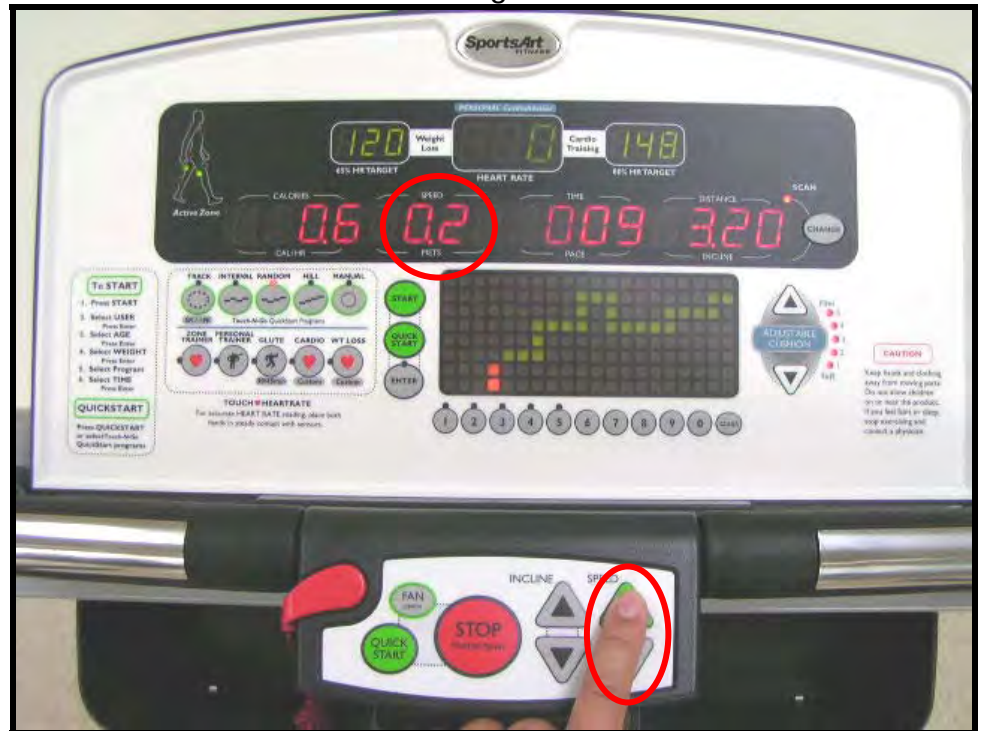
To set Speed:

1. After selecting a speed, the unit shows 0. See Fig. 1.
2. If no key is pressed, "PRESS SPEED UP" appears.
3. Press SPEED < ▲ > key. Unit starts to operate. Display shows speed value as shown in Fig. 2.

Fig. 1



Fig. 2



< PROGRAM > Mode

1. After using QUICK START or pressing START and entering user information, you can activate an exercise program. See Fig. 1.
2. Press any program key. The related program LED lights, and the dot matrix window shows the exercise program illustration. See Fig. 2.
3. Program modes include MANUAL, HILL, RANDOM, INTERVAL, WT Loss, CARDIO, GLUTE, PERSONALTRAINER, ZONE TRAINER, TRACK (TR33 only).

Fig. 1



Fig. 2



Programs: < TRACK > Key Function (TR33 Only)

1. Press the TRACK key. The display shows "TRACK" to indicate entry into the track program. See Fig. 1.
2. Each time the TRACK key is pressed, different TRACK modes appear: TRACK->TRACK 5K->TRACK 10K. See your preferred exercise routine. Then press < ENTER > to confirm your choice. See Fig. 2.
3. Similarly, in 5 K or 10 K modes, press to select your preferred exercise routine. Then press < ENTER > to confirm your choice.
4. Press SPEED < ▲ > to start exercising.

Fig. 1



Fig. 2



Programs: < WT Loss > and < CARDIO >

1. The user must first wear a telemetry strap before operating these programs. USER AGE and WEIGHT must also be entered. When "SELECT PROGRAM" appears, do the following:

- Press the WT Loss key. The weight loss indicator lights.
- Press the CARDIO key. The cardio indicator lights.

Both programs use AGE and WEIGHT settings to produce 65% (WT Loss) or 85% (Cardio) peak heart rate workout goals. Press the < ENTER > key to confirm your choice. See Fig. 1.

2. Press the INCLINE < ▲ > / < ▼ > key to set the duration for the exercise. Range: 5:00~99:00.

Press < ENTER > to confirm your choice. See Fig. 2.

3. Press SPEED < ▲ > key. The walk belt rotates; the SPEED window shows the speed value.

4. Press SPEED < ▲ > / < ▼ > again. The window shows "MAX SPEED XX KPH" and the maximum speed, as shown in Fig. 3.

Fig. 1



Fig. 2

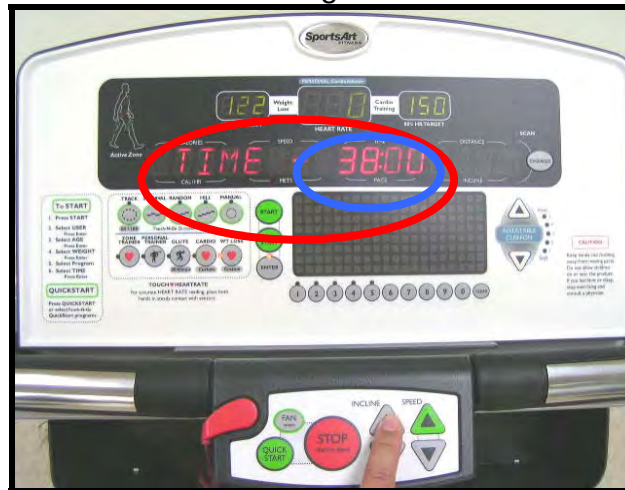
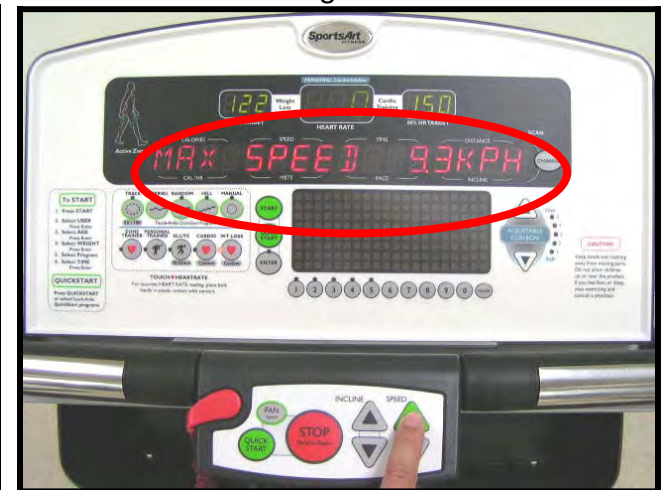


Fig. 3



Programs: < GLUTE >

1. Press the GLUTE key. The display shows "GLUTE 30". See Fig. 1.
 2. Press the GLUTE key again to see another choice. Each time the key is pressed, a different routine appears.
- Range: GLUTE 30->GLUTE 45. Press < ENTER > to confirm your choice. See Fig. 2.
3. Specifications: GLUTE 30: Segment 1~13; time: 30 minutes.
GLUTE 45: Segment 1~16; time: 45 minutes.

Fig. 1



Fig. 2



Programs: < ZONE TRAINER >

1. First, put on the heart rate telemetry strap. Press the <ZONE TRAINER> key while exercising. The unit detects the heart rate as the goal. See Fig. 1.
2. Press SPEED < ▲ > / < ▼ > keys to set the maximum speed. "MAX SPEED XX KPH" appears as in Fig. 2.

Fig. 1



Fig. 2



< QUICK START > Key Function

1. Press < QUICK START > or the < SPEED > key. The display appears as shown below. The manual program LED lights.
2. A countdown begins: 3~1. When the countdown ends, the walk belt begins to rotate.
3. Press the SPEED<▲>/<▼> key to determine the unit speed.



< SPEED > Key Function

1. Press SPEED<▲>. The value in the SPEED window increases. The walk belt rotates. See Fig. 1.
2. Press SPEED<▼>. The value in the SPEED window decreases. Unit speed decreases.
3. Speed range: MPH: 0.1~12 MPH; KPH: 0.2~20KPH.



< INCLINE > Key Function

1. Press INCLINE<▲> key. The value in the INCLINE window increases. See Fig. 1.
 2. Press the INCLINE<▼> key. The value in the INCLINE window decreases. See Fig.2.
- The incline operates downward.
3. Incline range: 0-15%.

Fig. 1



Fig. 2



< STOP > Key Function

1. In Quick Start mode, press the < STOP > key. "SPORTSART--TR3X" appears as the unit calibrates itself, ready to operate (Fig. 1).
2. In program mode, press the < STOP > key. "--PAUSE--" appears as the unit pauses. Press SPEED to continue unit operation (Fig. 2).
3. In program mode, press < STOP > for three seconds. "SPORTSART--TR3X" appears. The incline and display windows recalibrate.

Fig. 1



Fig. 2



< FAN > Key Function

Standard on TR33; Option on TR31 and TR32

1. While the treadmill is in operation, press the FAN key to activate the fan.

Press once for low speed; Press twice for medium speed; press three times for high speed.

At the fourth time the key is pressed the fan stops.

2. Corresponding information appears for two seconds: "FAN-LOW"->"FAN-MID"->"FAN-HIGH"->"FAN-STOP".



< CHANGE > Key Function

TR31/TR32/TR33 treadmills have two rows of display information and corresponding LEDs.

1. When the top LED lights, CALORIES, SPEED, TIME, and DISTANCE information appears.
2. When the lower LED lights, CAL/HR, METS, PACE, and INCLINE information appears.
3. When the SCAN LED lights, the row displayed alternates. One row appears for six seconds, then the other row appears for six seconds.



< CHANGE > Key Function - User ID Change

1. In USER1~4 mode, hold down the <CHANGE> key for three seconds to change USER ID information. See Fig. 1.
2. Press INCLINE < ▲ > / < ▼ > to choose numbers or letters. Press < ENTER > key to the next entry position. See Fig. 2.
3. When the revision is done, hold the < ENTER > key three seconds. The new user ID appears, for example, "USER-SINNY" for confirmation. See Fig. 3.
4. To cancel this revise USER ID, hold the < CLEAR > key for three seconds. The original user number appears.
5. The user setting range: numbers 0~9, or letters A~Z.

Fig. 1



Fig. 2



Fig. 3



< CLEAR > Key Function

1. When entering USER information, press <CLEAR> to cancel errors. See Fig. 1-2.
2. In USER1~4 mode, hold down the <CLEAR> key for three seconds. The user's accumulated information, such as CALORIES, TIME, DISTANCE clears to 0. See Fig. 3.

Fig. 1



Fig. 2



Fig. 3



< CUSHION > Key Function

Only available on TR33.

1. Press the CUSHION<▲> key. Cushion level LEDs light going up. The higher the number, the more firm the cushion.
2. Press the CUSHION<▼> key. Cushion level LEDs light going down. The lower the number, the softer the cushion.



TR31/TR32/Tr33 Treadmill Repair Manual

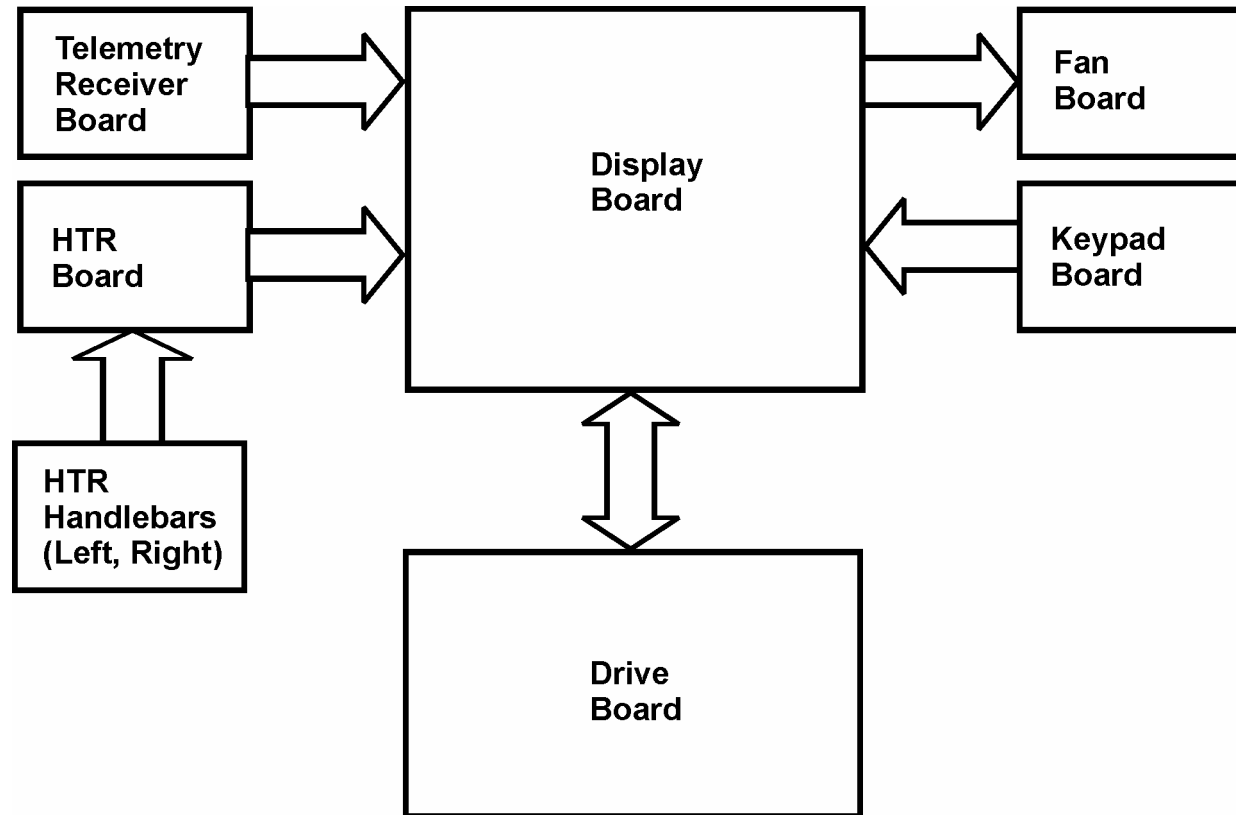
Chapter 4

4-0-0 System Block Diagrams

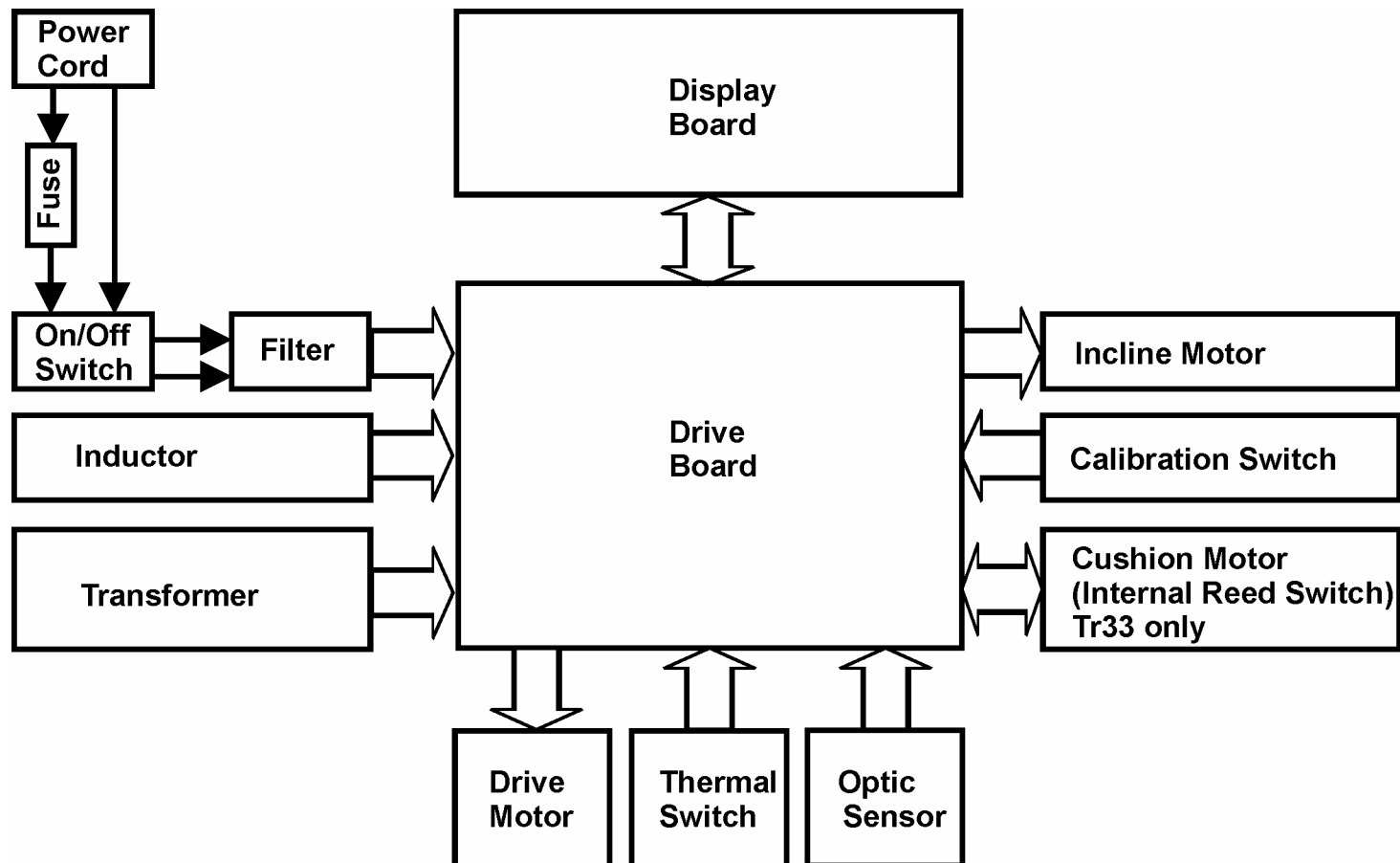
4-1-1 TR31/TR32/TR33 Display Board Wire Connections – Block Diagram

4-1-2 TR31/TR32/TR33 Drive Board Wire Connections – Block Diagram

TR31/TR32/TR33 Display Wire Connections - Block Diagram



TR31/TR32/TR33 Drive Board Wire Connections - Block Diagram



TR31/TR32/Tr33 Treadmill Repair Manual

Chapter 5

5-0-0 Display Board

5-1-1 TR31/TR32/TR333 Display/Drive Board Wire Connections – Block Diagram

5-1-2 TR33 Display Component Placement – Illustration

5-1-3 TR33 Display LED Placement and Definitions – Illustration

5-1-4 TR33 Display Wire Connections – Illustration

5-1-5 TR31/TR32 Display Component Placement – Illustration

5-1-6 TR31/TR32 Display LED Placement – Illustration

5-1-7 TR31/TR32 Display Wire Connections – Illustration

5-2-0 Drive Board

5-2-1 TR31/TR32/TR33 Drive Board Wire Connection – Block Diagram

5-2-2 TR31/TR32/TR33 Drive Board Component Placement – Illustration

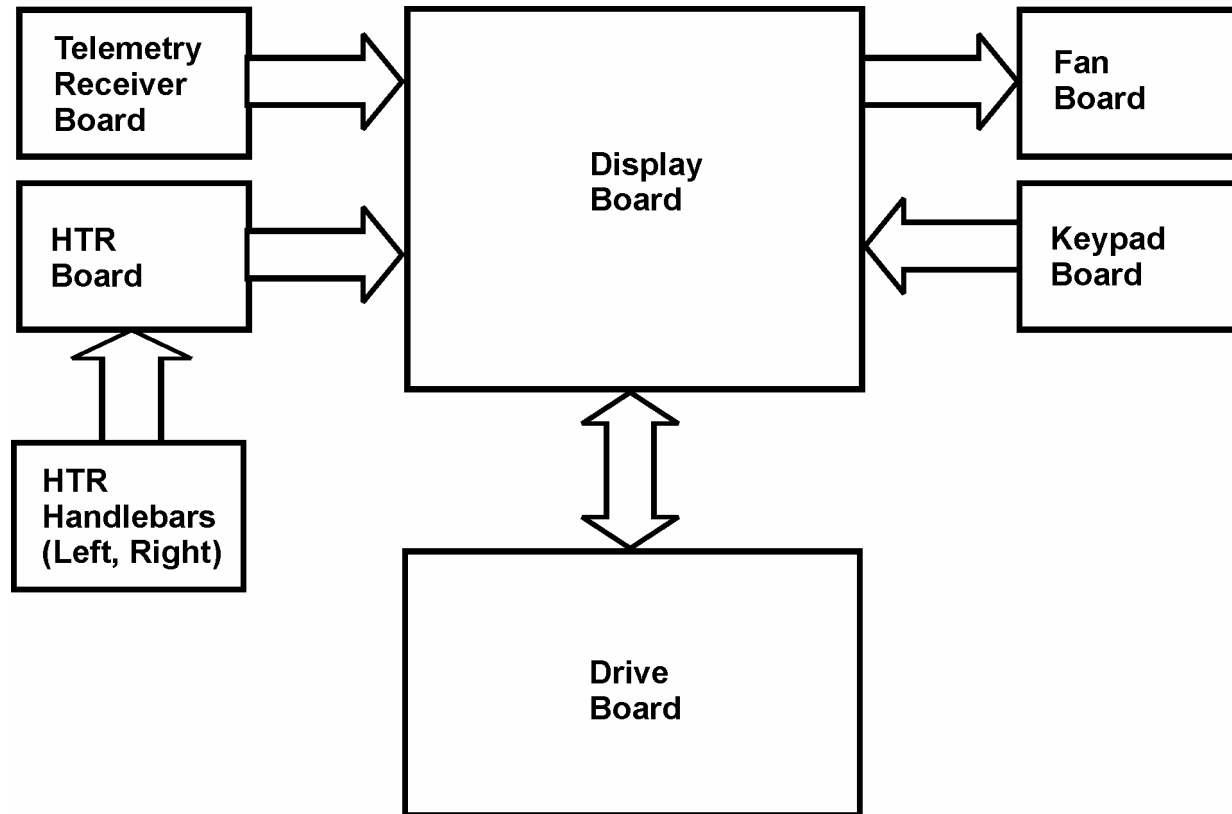
5-2-3 TR31/TR32/TR33 Drive Board LED Indicators 1 – Illustration

5-2-4 TR31/TR32/TR33 Drive Board LED Indicators 2 – Illustration

5-2-5 TR31/TR32/TR33 Drive Board Connections – Illustration

5-2-6 TR31/TR32/TR33 Motor Control Jumpers on Drive Board – Illustration

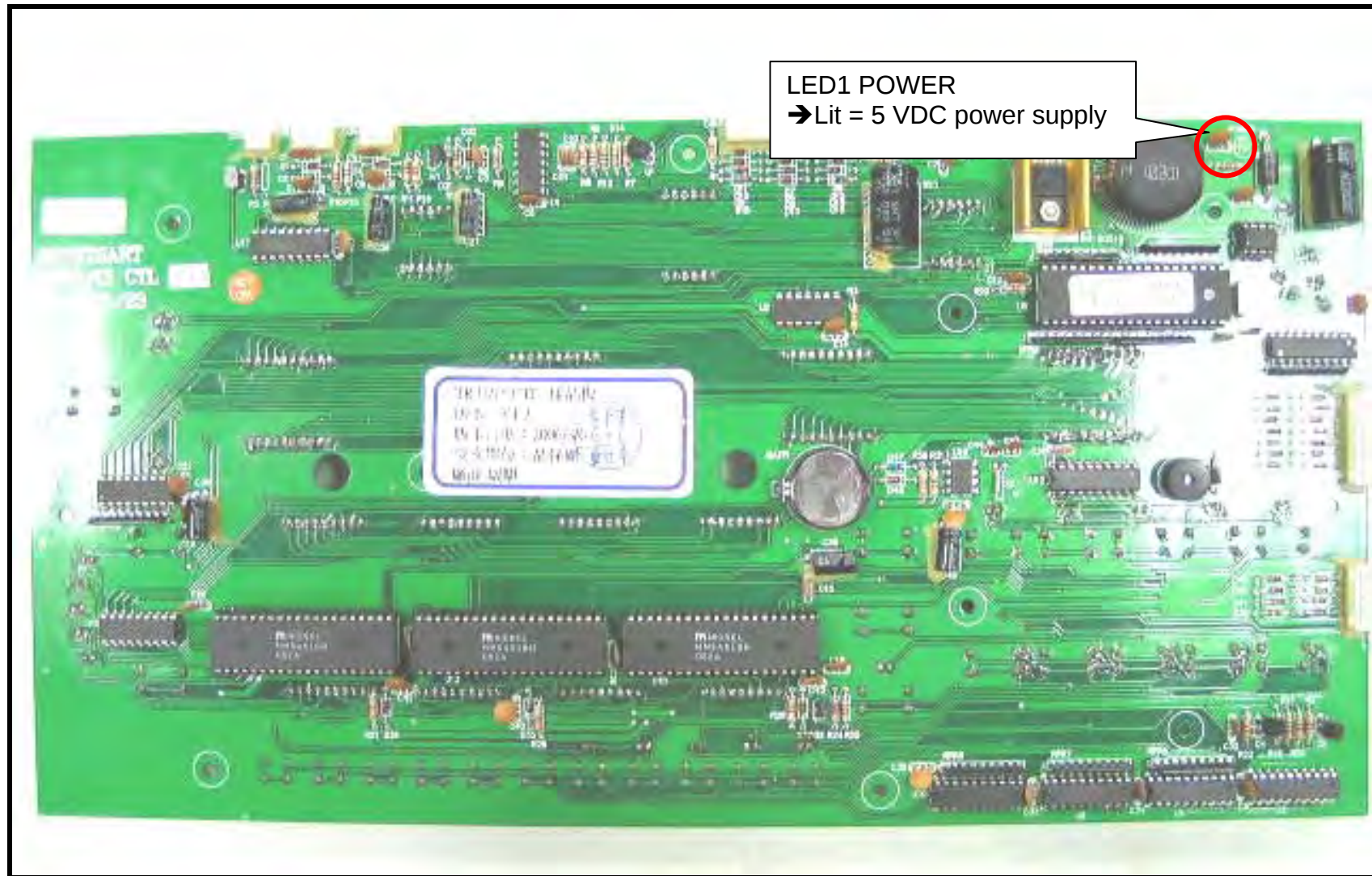
TR31/TR32/TR33 Display/Drive Board Wire Connection – Block Diagram



TR33 Display Component Placement - Illustration



TR33 Display LED Placement and Definitions - Illustration



TR33 Display Wire Connections - Illustration

CON2
→ Connect to
emergency stop

CON3
→ Connect to HTR
board

CON4
→ Connect to telemetry
board

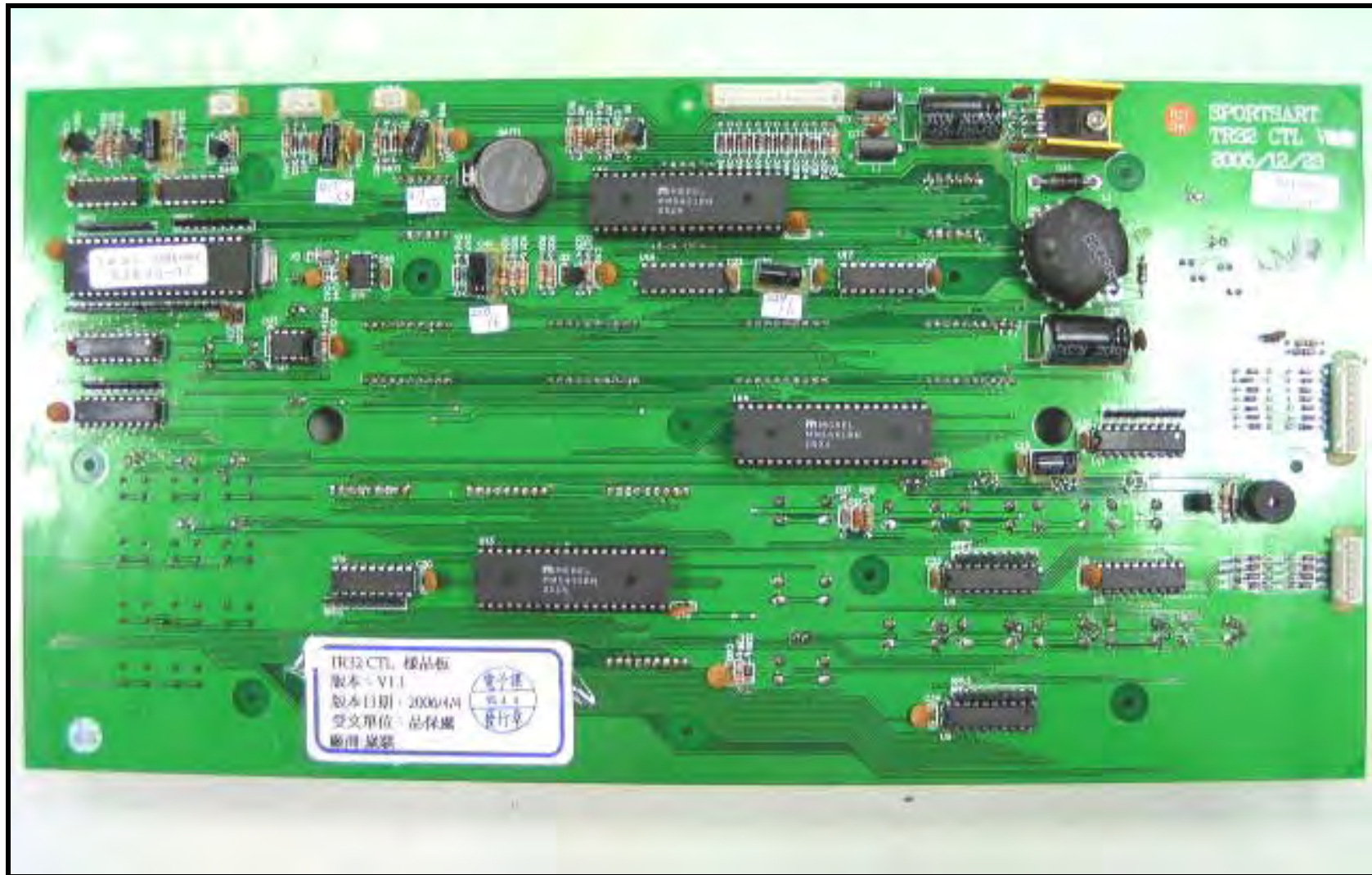
CON1
→ Connect to drive
board

CON5
→ Connect to key
board

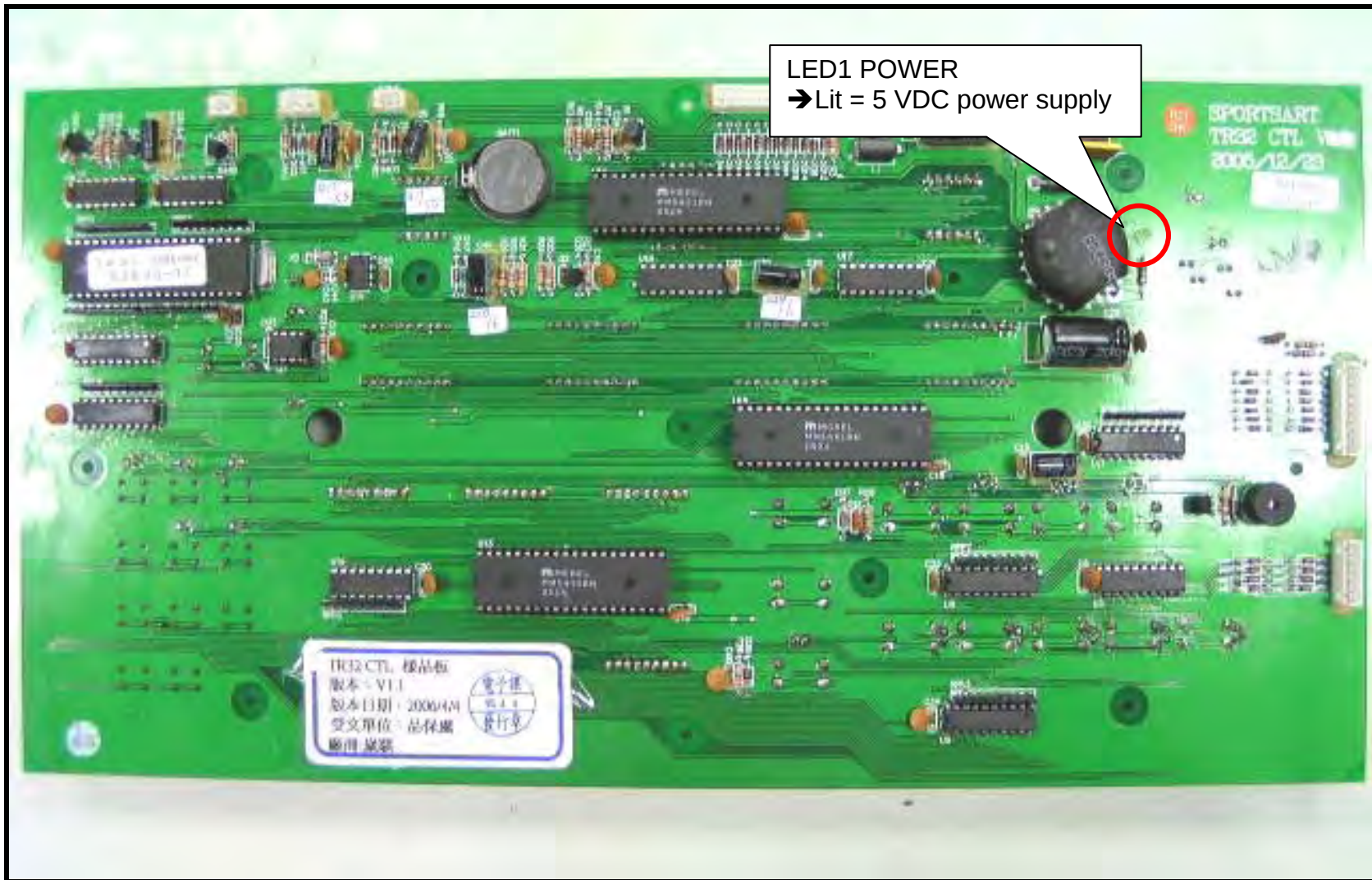


CON6
→ Connect to fan circuit board

TR31/TR32 Display Component Placement - Illustration



TR31/TR32 Display LED Placement - Illustration



TR31/TR32 Display Wire Connections - Illustration

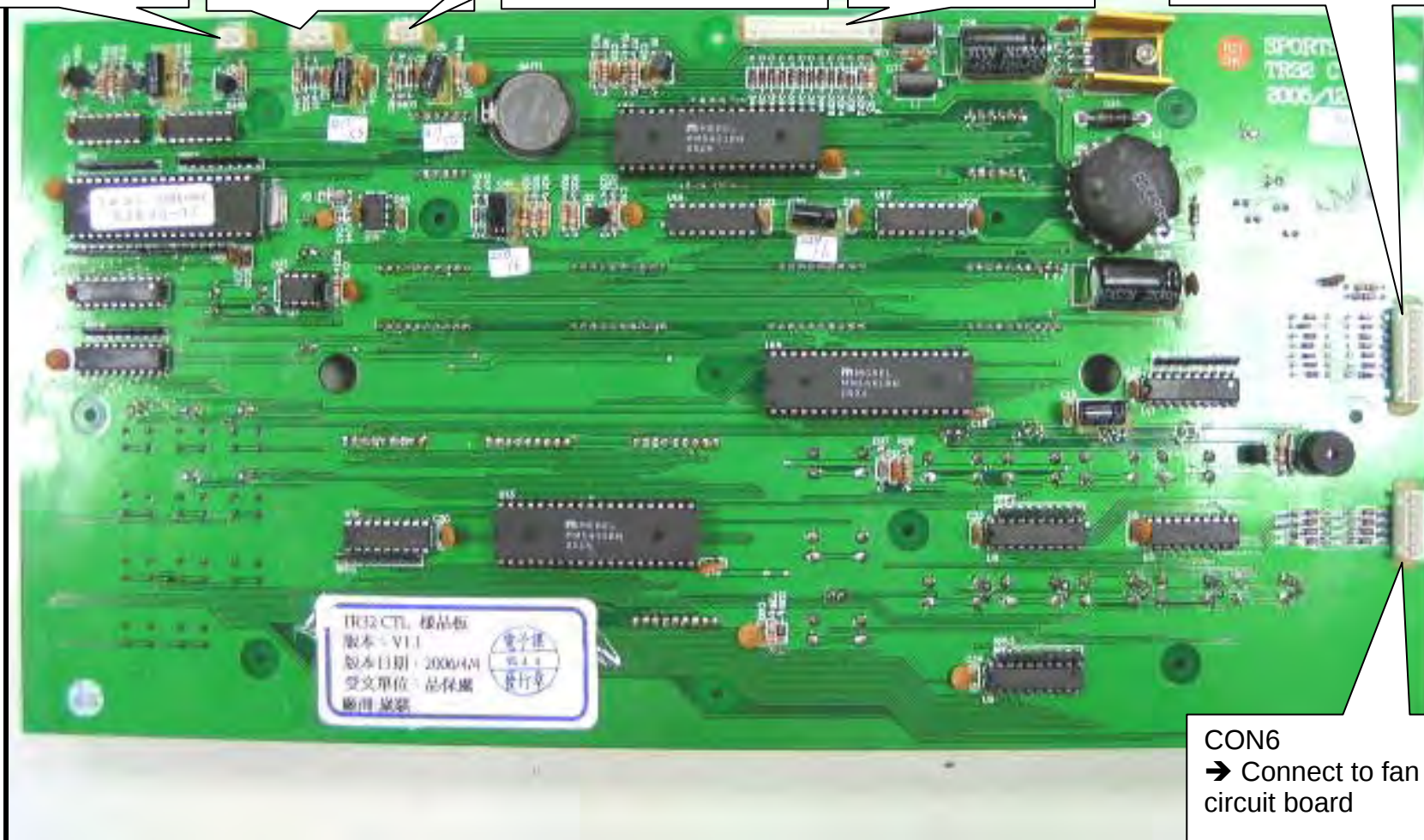
CON2
→ Connect to
emergency stop

CON3
→ Connect to HTR
board

CON4
→ Connect to telemetry
board

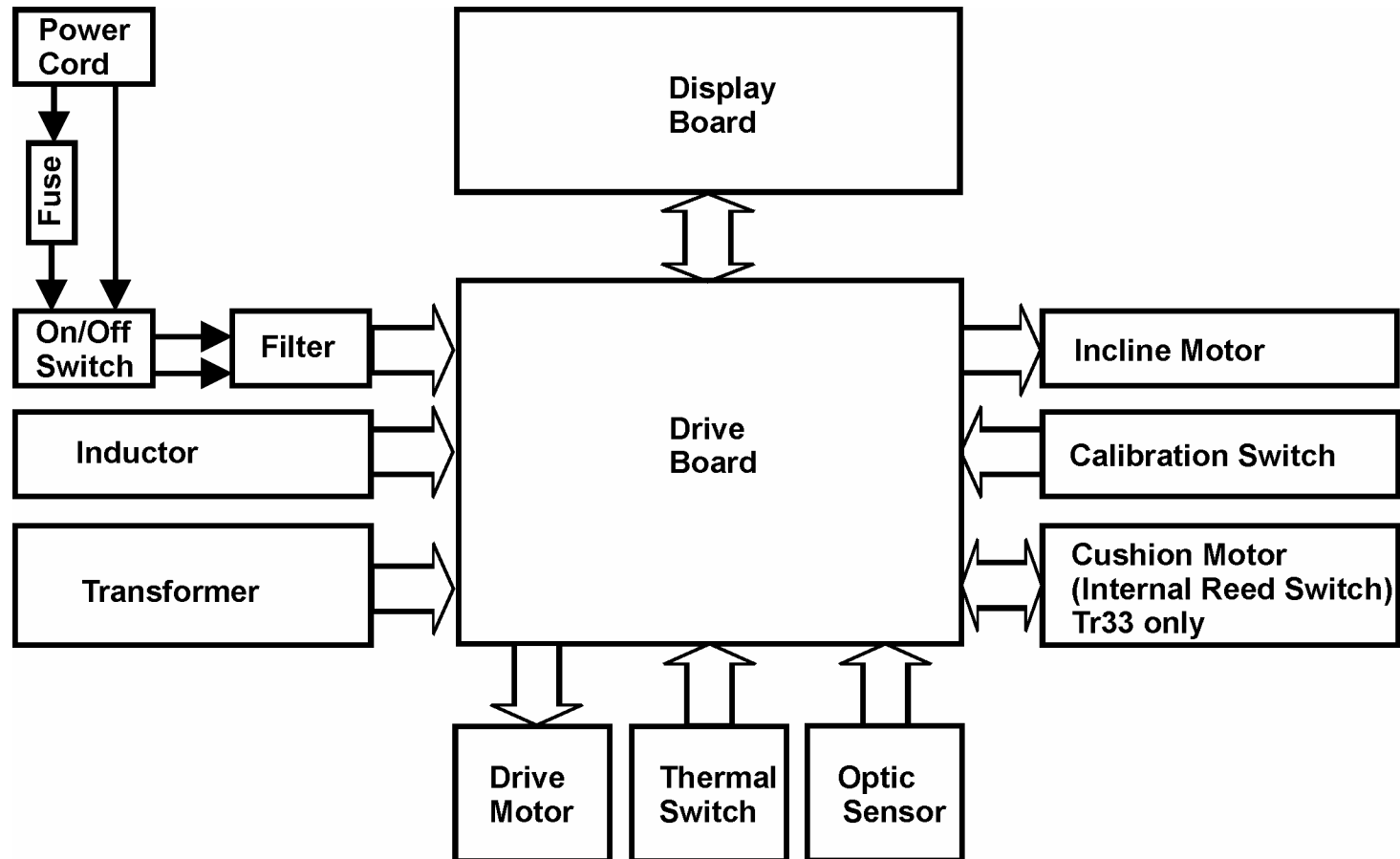
CON1
→ Connect to
drive board

CON5
→ Connect to key
board

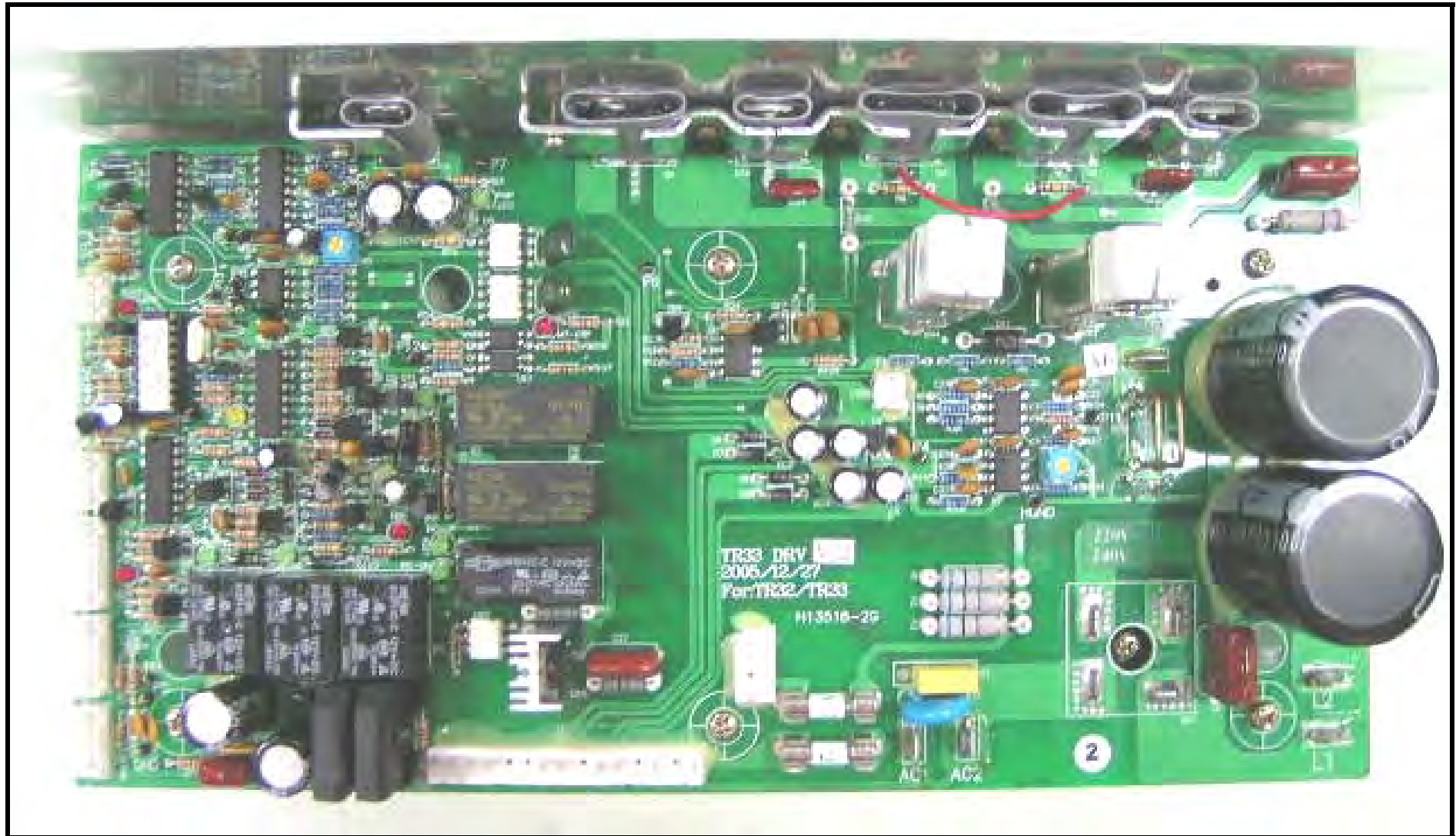


CON6
→ Connect to fan
circuit board

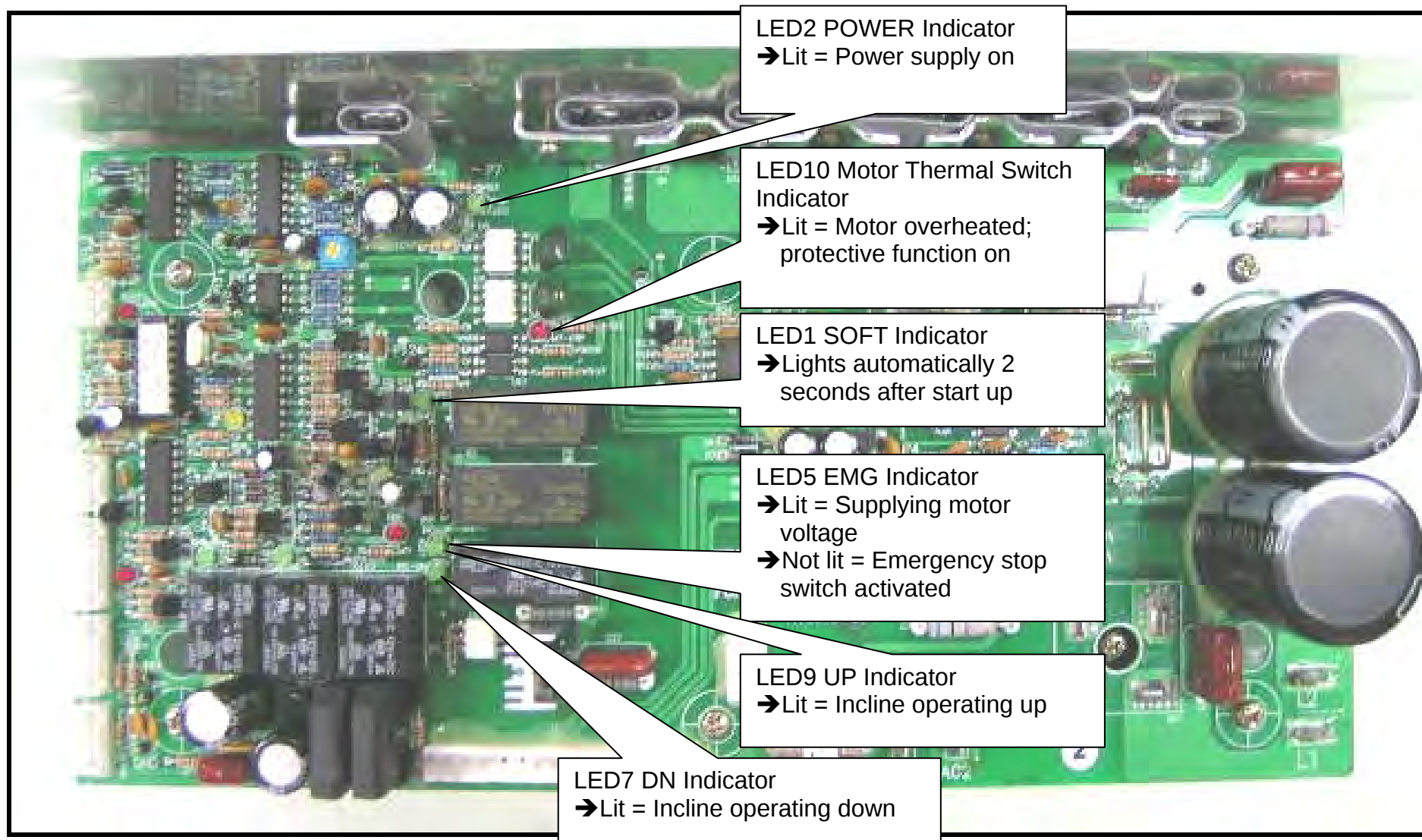
TR31/TR32/TR33 Drive Board Wire Connection – Block Diagram



TR31/TR32/TR33 Drive Board Component Placement - Illustration



TR31/TR32/TR33 Drive Board LED Indicators 1 - Illustration



TR31/TR32/TR33 Drive Board LED Indicators 2 - Illustration

LED8 ZERO Indicator
→ Lit = incline already calibrated

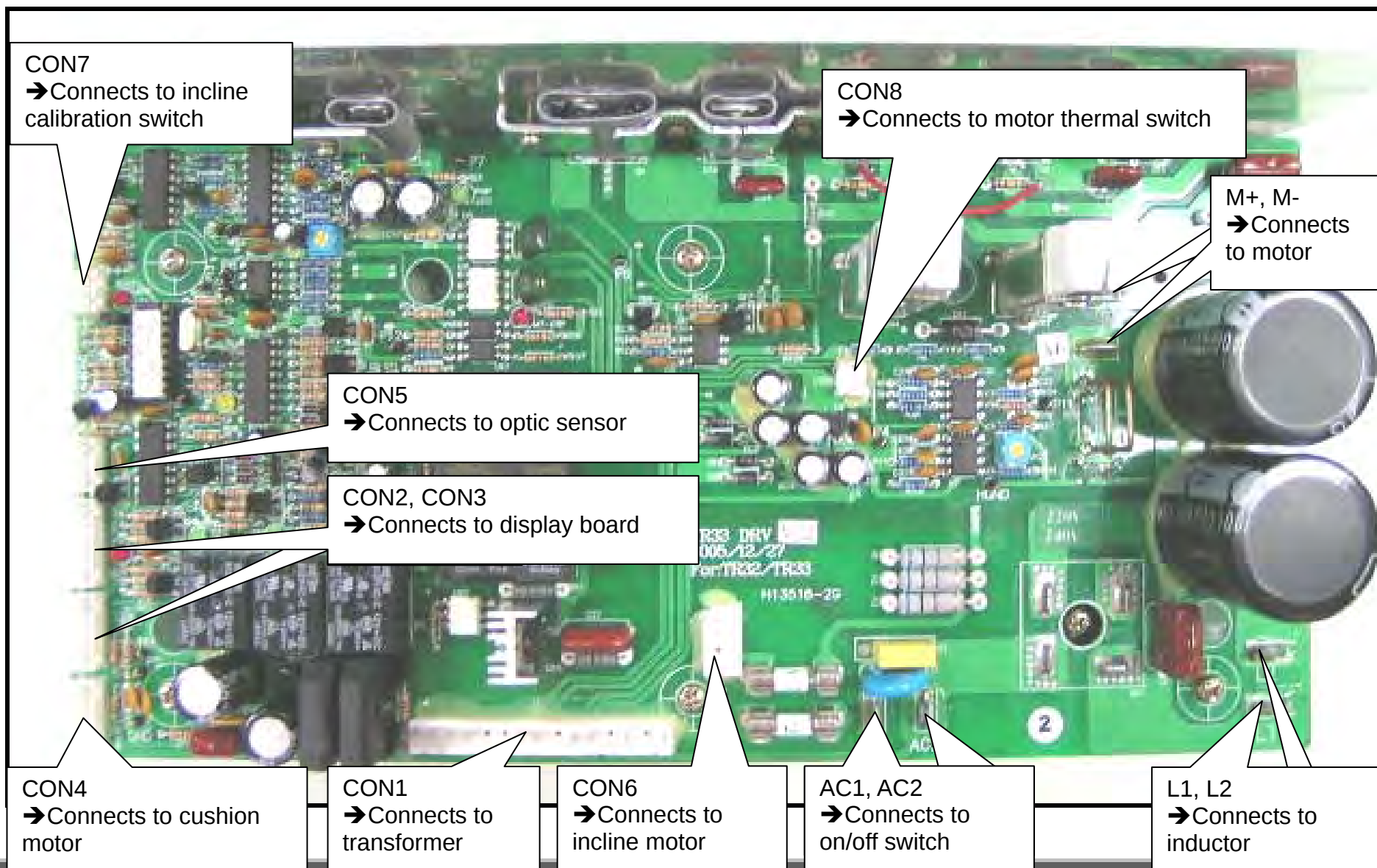
LED6 MC Indicator
→ Flashing indicates motor movement.

LED4 CUS_UP Indicator
→ Lit = Cushion motor is extended (firm).

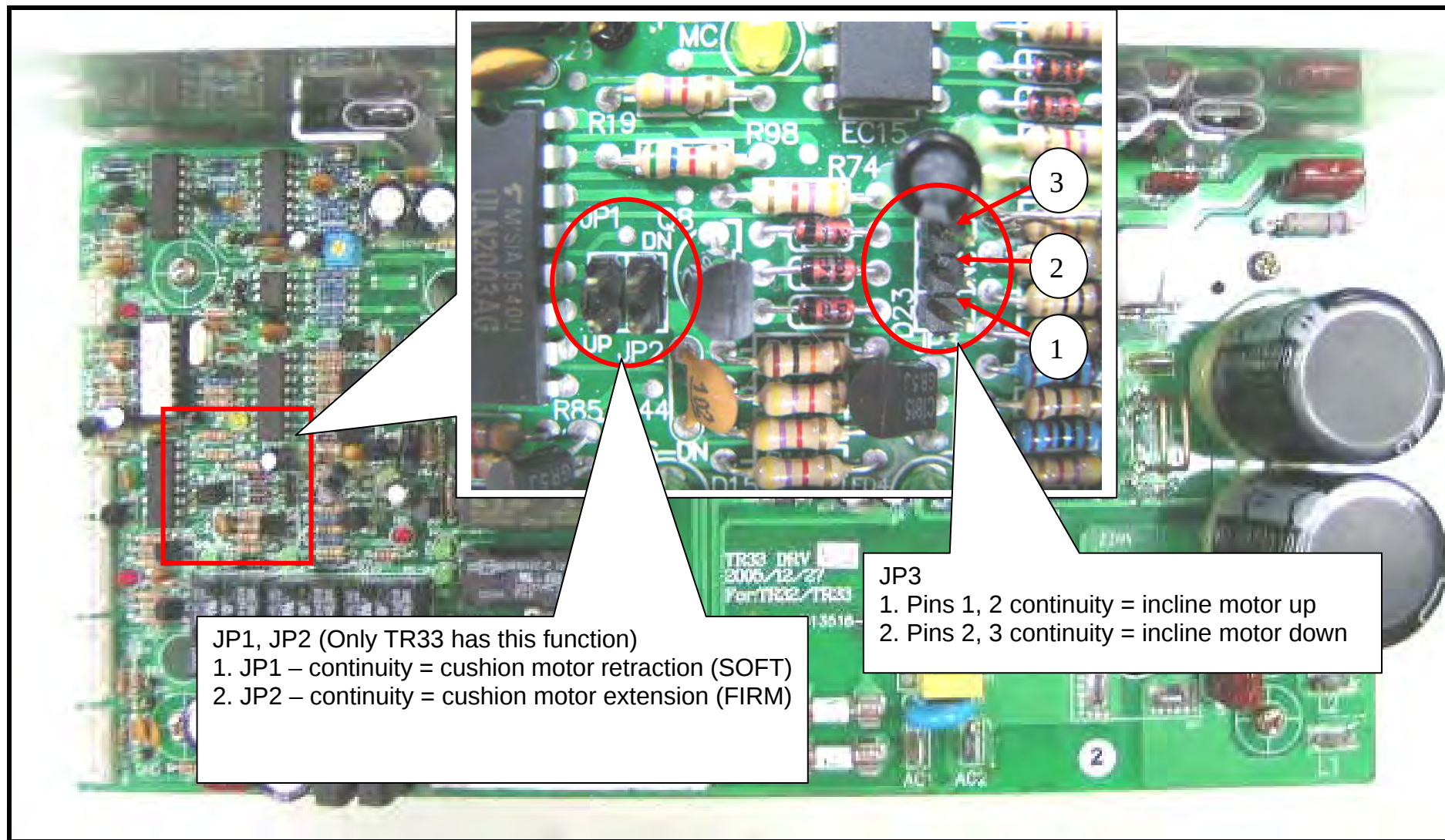
LED11 I_SENSE Indicator
→ Lit = High current protective function is activated.

LED3 CUS_DN Indicator
→ Lit = Cushion motor is retracted (soft).

TR31/TR32/TR33 Drive Board Connections - Illustration



TR31/TR32/TR33 Motor Control Jumpers on Drive Board - Illustration



TR31/TR32/Tr33 Treadmill Repair Manual

Chapter 6

6-0-0 Error Messages

6-1-1 TR31/TR32/TR33 Error Messages: ERR1 – Motor Does Not Move (Continued to 6-1-3)

6-1-4 Test for Motor Voltage at the Drive Board (Continued to 6-1-5)

6-2-1 TR31/TR32/TR33 Error Messages: ERR1 – Motor Operates (Continued to 6-2-3)

6-3-1 TR31/TR32/TR33 Error Messages: ERR3 (Continued to 6-3-3)

6-4-1 TR31/TR32/TR33 Error Messages: ERR7 (Continued to 6-4-3)

6-4-4 Test of Incline Limiter Switch at the Drive Board (Continued to 6-4-5)

6-5-1 TR31/TR32/TR33 Error Messages: Keys Do Not Operate (Continued to 6-5-2)

6-5-3 Display Board component Placement – TR33 U11 74245

6-6-1 TR31/TR32/TR33 Error Messages: Unit Will Not Turn On (Continued to 6-6-4)

6-7-1 TR31/TR32/TR33 Error Messages: Telemetry Heart Rate Malfunction (Continued to 6-7-3)

6-8-1 TR31/TR32/TR33 Error Messages: Incline Does Not Operate (Continued to 6-8-3)

6-8-4 Test for Incline Voltage at the Drive Board (Continued to 6-8-5)

6-8-6 Incline Calibration Procedure (Continued to 6-8-9)

6-9-1 TR33 Error Messages: Cushion Adjustment Does Not Operate (Continued to 6-9-5)

6-10-1 TR31/TR32/TR33 Error Messages: Main Fuse Blows (Continued to 6-10-3)

6-11-1 TR31/TR32/TR33 Error Messages: Service Required (Continued to 6-11-3)

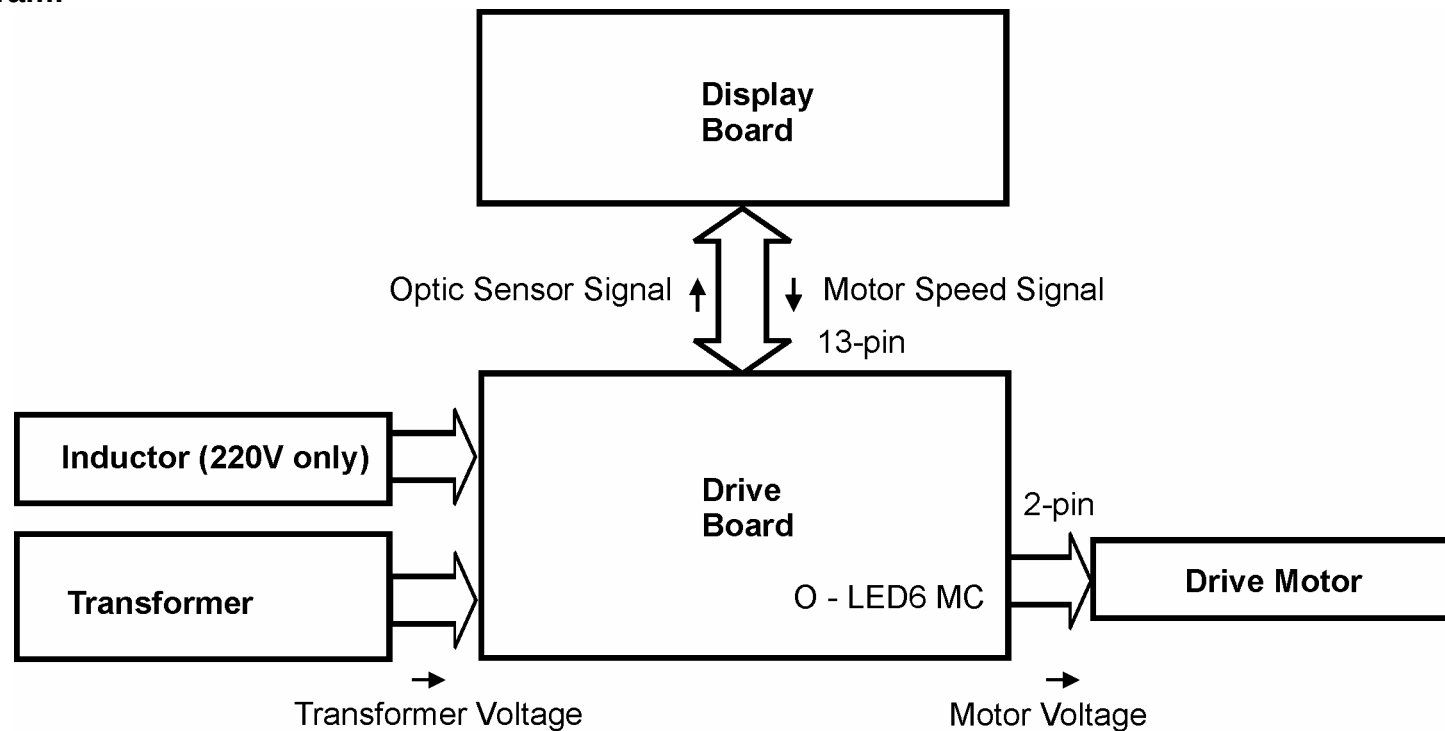
6-11-4 Thermal Switch and Wire Test (Continued to 6-11-5)

6-12-1 HTR Malfunction (Continued to 6-12-3)

TR31/TR32/TR33 Error Messages: ERR 1 - Motor Does Not Operate

Definition: Motor does not operate; Display CPU cannot read the optic sensor signal.

Block Diagram:



Normal Operation

Order	Part	Operation
1	Display	1. Press the SPEED key; Display speed window shows "0.0". 2. Display CPU sends the motor control signal to the drive board.
2	Inductor (220V)	1. (Inductor is only on 220V units.) 2. Drive board sends VH voltage to the drive board motor circuit.
3	Transformer	1. Supplies voltage to the drive board motor circuit.
4	13-pin Cable	Signal travels from the display to drive board.
5	Drive Board	Processes motor speed signal and emits voltage to the motor, making the motor operate.
6	Motor	The motor moves according to voltage from the drive board. Walk belt rotates.

Circumstance of Malfunction

1. Press SPEED<▲> or <▼>. The treadmill walk belt does not rotate. Display shows "ERR:1".

Possible Causes of Malfunction

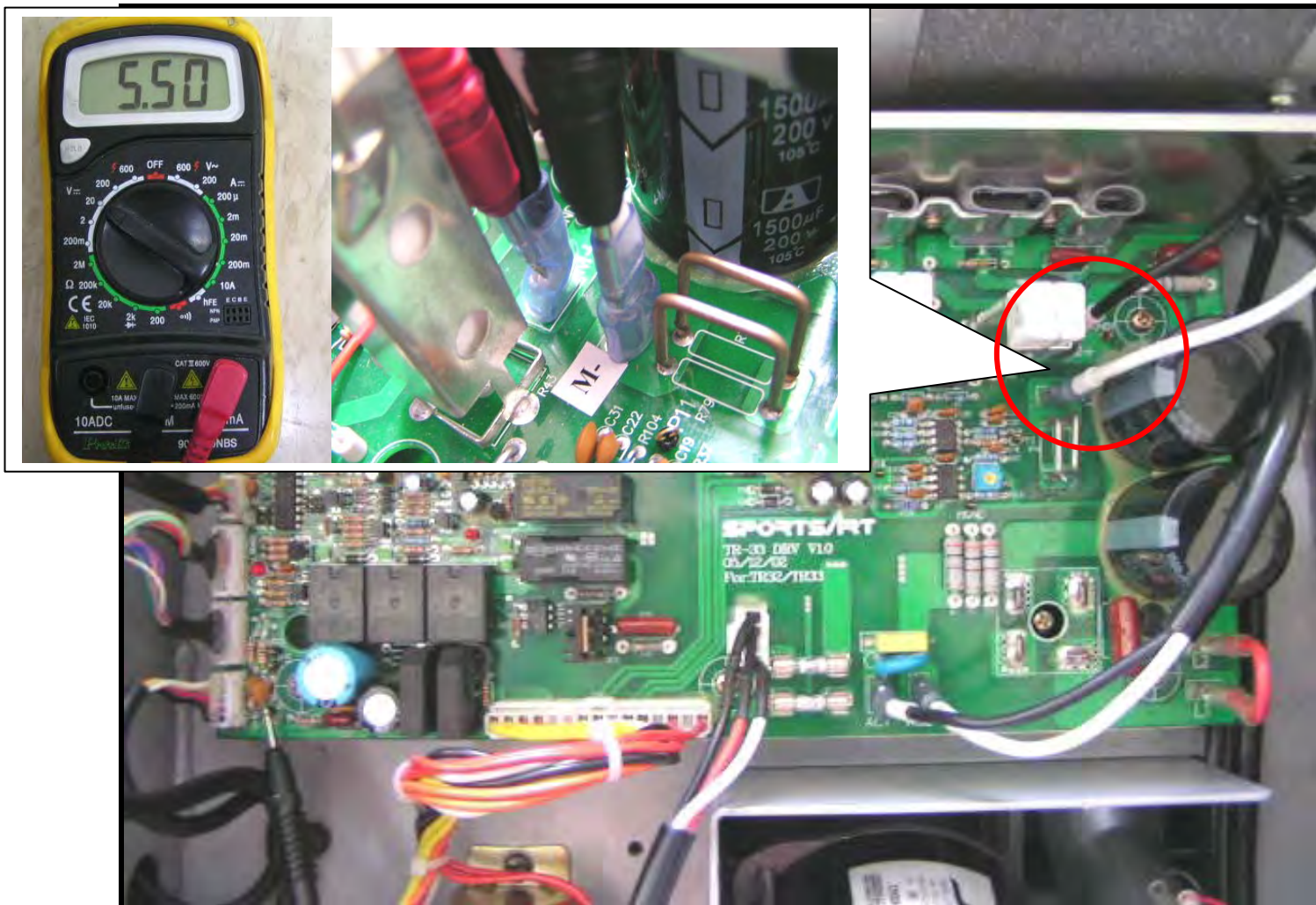
1. There is no voltage to the drive board M+, M- wires, so the motor does not operate.
2. The motor receives voltage but is broken and does not operate.

Troubleshooting

Order	Part	Troubleshooting
1	Display board	1. Press on the display IC chips to ensure a good contact. 2. Inspect connections of the data cable from the display to the drive board.

Step	Part	Troubleshooting
2	Data Cable	1. Inspect connections of the data cable from the display to the drive board. 2. Inspect whether the cable is crimped or broken. 3. Replace the data cable as a test.
3	Inductor	1. Reconnect inductor wires.
4	Transformer	1. Inspect the transformer wire connections. 2. Test the transformer output for voltage.
5	Drive Board	1. Inspect whether the drive board EMG indicator is lit. If so, inspect the safety key circuit. 2. Inspect whether the drive board LED 11 is lit. If so, the IGBT has shorted or the current overload protective function on the drive board is activated so the motor does not run. 3. Inspect connections to the transformer and inductor. 4. Test transformer output voltage. 5. Test drive board M+, M- terminals. Test whether there is voltage when the speed key is pressed. 6. Inspect the drive board IC connections. 7. Replace the drive board as a test.
6	Motor	1. If the drive board outputs voltage but the motor does not operate, the motor is bad. Replace it. 2. Inspect M+, M- wire connections on the drive board. 3. Test M+, M- terminals for voltage. 4. Inspect motor brushes.

Test for Motor Voltage at the Drive Board



Test Procedure

1. Set voltmeter to the 200 VDC setting. Place probes on the M+, M- terminals.
2. Turn on unit power. Press SPEED<▲>. Voltmeter should show voltage. Motor should operate.
3. Voltage specifications:
Lowest speed 0.2 KPH (0.1 MPH); Voltage: 5.5-6.5 V (110V) or 9-11 V (220V)
Highest speed 20.0 KPH (12.0 MPH); Voltage: 100-120V (110V) or 210-230V (220V)
4. If the drive board does not put out any voltage, the motor cannot operate.

Circumstance of Malfunction

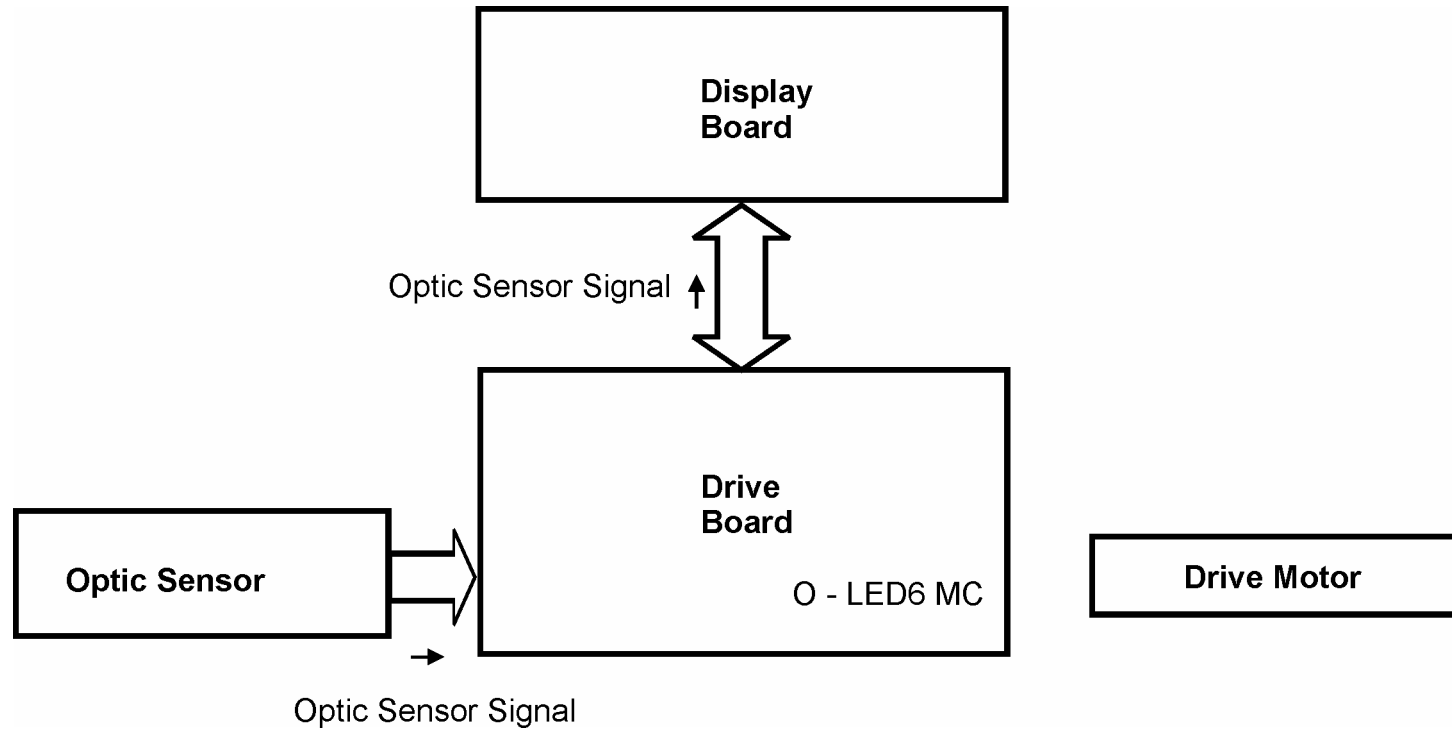
If the drive board does not put out power, inspect the following:

1. Does the drive board EMG LED light? If so, IGBTs may have shorted out. Test IGBTs for a short.
2. Replace the drive board as a test.

TR31/TR32/TR33 Error Messages: ERR 1 - Motor Operates

Definition: 1. Motor operates but the display CPU does not read the optic sensor signal.

Block Diagram:



Operation

Order	Part	Operation
1	Optic Sensor and Wheel	1. When the motor moves, the optic sensor wheel moves. 2. The optic sensor detects movement.
2	Optic Sensor	1. The optic sensor signal is transmitted to the drive board.
3	Drive Board	1. The optic sensor signal, labeled MC, for motor control, flashes.
4	Data Cable	1. The signal travels from the drive board to the display.
5	Display Board	1. The display CPU reads the optic sensor signal. 2. If it does not detect an optic sensor signal, "ERR1" appears.

Circumstance of Malfunction

1. Press the SPEED<▲> or <▼> key. The walk belt moves. But "ERR:1" appears.

Possible Causes

1. The optic sensor signal malfunction. No signal is read.
2. The optic sensor signal does not reach the display. The display cannot read the optic sensor signal.

Troubleshooting

Step	Part	Troubleshooting
1	Optic Wheel	1. Inspect whether the optic wheel is attached properly. 2. Inspect whether the optic wheel rotates in the middle of the optic sensor.

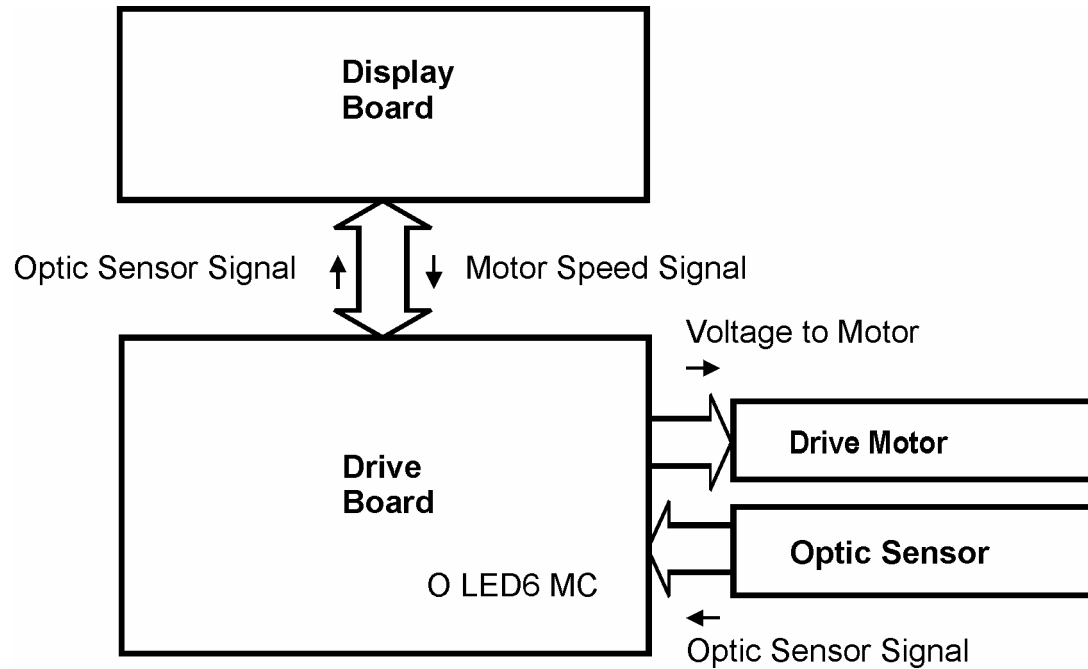
SportsArt_{FITNESS}

Step	Part	Troubleshooting
2	Optic Sensor	1. Inspect whether the optic sensor wire is connected properly. 2. Inspect whether the optic sensor detects movement when the optic wheel moves. The MC LED on the drive board flickers when movement is detected.
3	Optic Sensor Wires	1. Inspect whether the optic sensor wire is connected properly. 2. Inspect whether the wire is broken or pinched.
4	Drive Board	1. Inspect the drive board CON5 connection. 2. Inspect the drive board CON2, CON3 wire connections. 3. Inspect the drive board LED6 MC. Does it flash as the motor moves.
5	Data Cable	1. Inspect the data cable from the display to the drive board.
6	Display Board	1. Inspect the CON1 connection. 2. Inspect connections of the U6 program IC.

TR31/TR32/TR33 Error Messages: ERR 3

Definition: 1. Display SPEED setting and actual speed differs too much.

Block Diagram:



Operation

Order	Part	Operation
1	Optic Wheel Optic Sensor	1. When the motor rotates, the optic wheel rotates. 2. The optic sensor detects movement.
2	Optic Sensor Wire	1. Optic sensor signal travels via the wire.
3	Drive Board	1. The drive board LED6 MC indicator flashes. 2. Speed circuit supplies power for motor operation.
4	Data Cable	1. The optic sensor signal travels to the display board.
5	Display Board	1. CPU reads the optic sensor signal. 2. If actual speed and display speed setting differ too much, err3 appears.

Circumstance of Malfunction

1. Press SPEED<▲> or <▼> key. The walk belt moves, but “ERR:3” appears.

Possible Reasons for Malfunction

1. Optic sensor malfunction causes ERR3.
2. Drive board circuit malfunction makes motor runs too fast or too slow.
3. Display malfunction makes ERR3 appear.

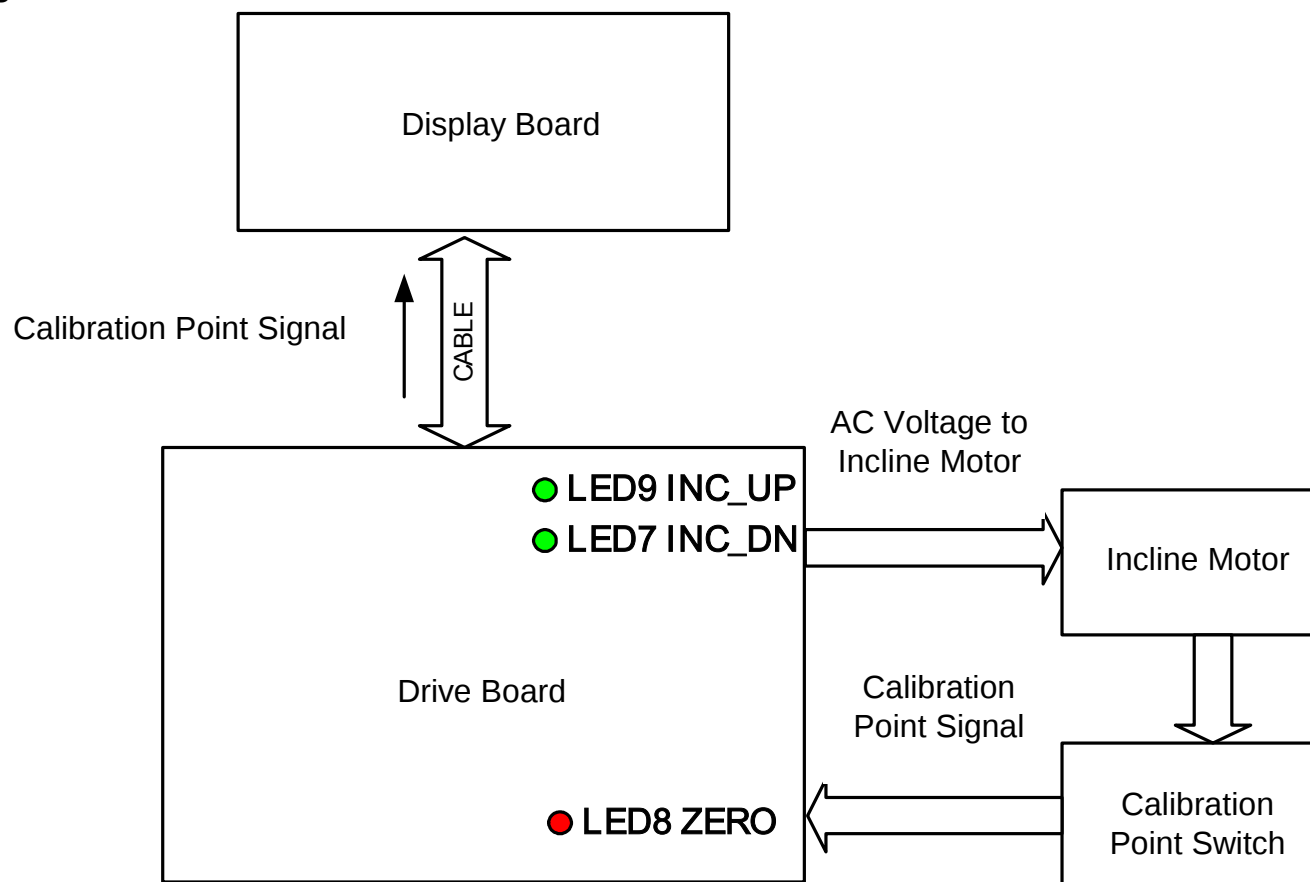
Troubleshooting

Step	Part	Troubleshooting
1	Optic Wheel	1. Inspect whether the optic wheel is fastened securely. 2. Inspect whether the optic wheel runs in the center of the optic sensor.
2	Optic Sensor	1. Inspect whether the optic sensor wire is connected properly. 2. Inspect whether LED6, the optic sensor signal indicator, lights when the wheel rotates.
3	Optic Sensor Wire	1. Inspect whether the optic sensor wire is connected securely.
4	Drive Board	1. Inspect wire connections to the drive board. 2. Inspect whether LED6, the optic sensor signal indicator, lights when the wheel rotates. 3. Replace the drive board as a test.
5	Data Cable	1. Inspect data cable connections at the display and drive boards.
6	Display Board	1. Inspect the CON1 connection. 2. Inspect the U6 IC connections. 3. Replace U6 IC as a test.

TR32/TR33 Error Messages: ERR 7

Definition: Incline motor calibration abnormality: 35~40 seconds after the down command was sent, the calibration base signal was not received.

Block Diagram:



Operation

Order	Part	Explanation
1	Limiter Switch	1. Switch operation sends the calibration point signal to the drive board.
2	Drive Board	1. The drive board sends the calibration point signal to the display, which calculates incline position.
3	Data Cable	1. The signal travels across the data cable to the display.
4	Display Board	1. CPU detects the calibration point signal. 2. If there is no calibration point signal within 35~40 seconds, "ERR7" appears.

Circumstance of Malfunction

1. After the decline signal is transmitted, if there is no calibration point signal after 35~40 seconds, "ERR-7" appears.

Possible Causes of Malfunction

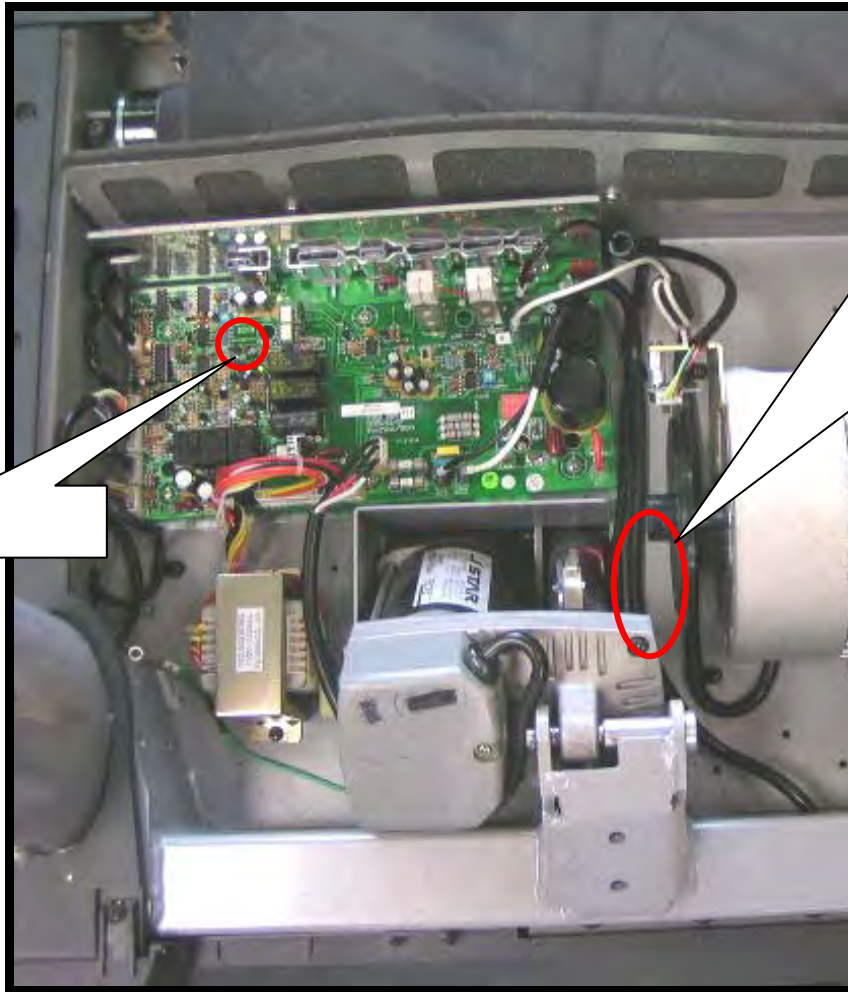
1. The limiter switch is defective.
2. Wires from the limiter switch to the drive board are disconnected or defective.

Inspection Points

Order	Part	Procedure
1	Limiter Switch	1. Inspect the limiter switch operation.
2	Data Cable	1. Inspect wires and their connection from the limiter switch to the drive board.

Order	Part	Procedure
3	Drive Board	1. Inspect whether LED8 (ZERO) on the drive board lights. 2. Inspect connections of the drive board CON3 cable. 3. Inspect whether F2 3A fuse is burnt or disconnected. 4. Replace Q16 C1815 or U14 PIC16F628A and test.
4	Data Cable	1. Inspect whether the data cable from the display to drive board is connected properly. 2. Inspect whether the data cable is pinched, creating an electrical "open".
5	Display Board	1. Inspect the display board CON1 connector. 2. Inspect the display board U2 40106 pin connection. 3. Inspect U6 SM8958A IC pin connection. 4. Replace U4 40106 IC and test operation.

Test of the Incline Limiter Switch at the Drive Board



LED8 ZERO



Test Procedure

1. Set multi-meter to the ohm Ω setting, 20 K Ω . Place probes on connector pins for the incline limiter switch.
2. Touch the incline limiter switch to activate it. Standard reading: 0 Ω .
3. Turn on power. Touch the incline calibration switch to activate it. LED8 ZERO lights.

Inspection points

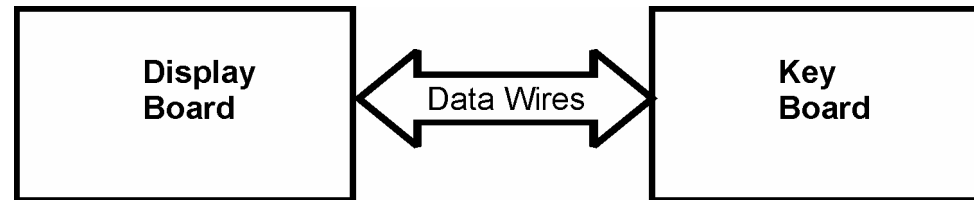
If not as above, replace the incline limiter switch.

TR31/TR32/TR33 Error Message: Keys Do Not Operate

Circumstance of Malfunction: 1. Unit is on. Press keys. Display has no reaction.

2. Do not press keys. Display reacts as if keys were pressed.

Block Diagram:



Operation

Order	Part	Operation
1	Key Switches	1. Key switch has an electronic "open". Press the key. Nothing happens. 1. Key switch has an electronic "short". Do not press a key. The key operates as if it had been pressed.
2	Wire Cable	1. Key switch signal travels to the display board.
3	Display Board	1. Display CPU reads the key signal. 2. Display reacts accordingly.

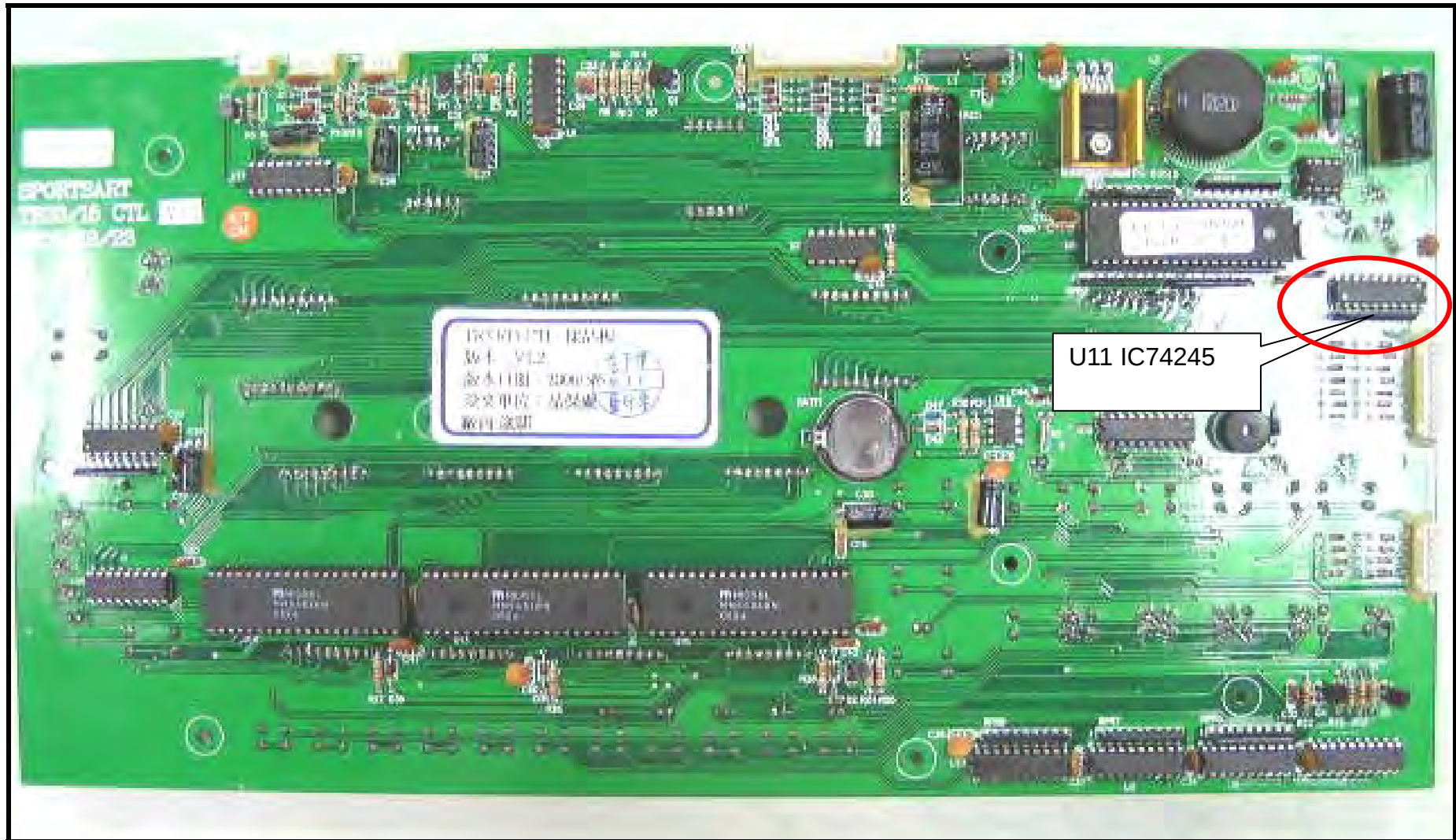
Possible Reasons for Malfunction

1. Key switch has an electrical short. No one presses the key. It shorts. Display reacts as if key had been pressed.
2. Key has an electrical open. Press the key. Circuit never closes. Display doesn't react.
3. Display key circuit malfunction.

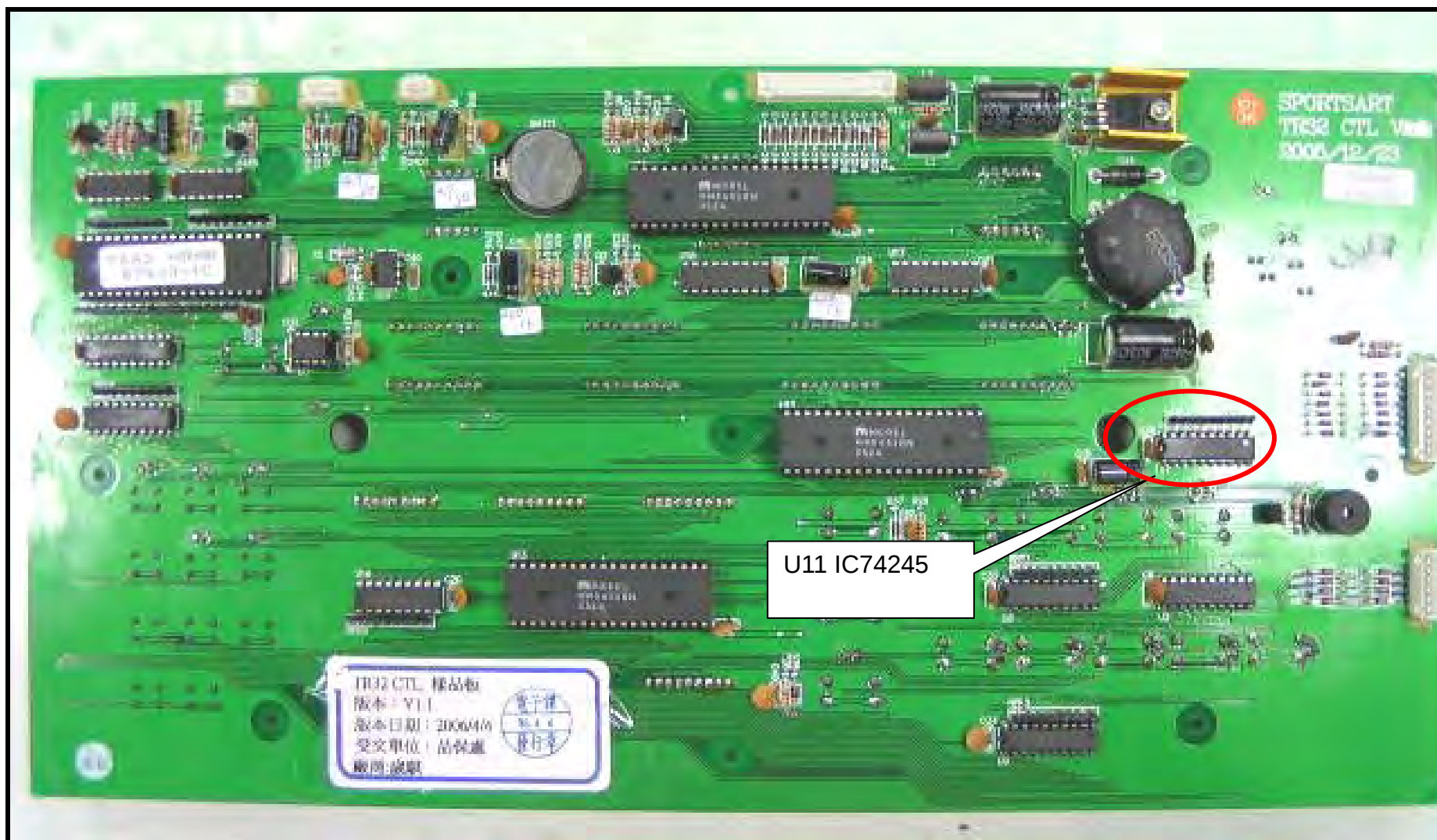
Troubleshooting

Step	Part	Troubleshooting
1	Key Switch	1. Test key functions.
2	Wire	1. Inspect wire connections.
3	Display Board	1. Test display CHANGE key operation. 2. If normal, replace U11 74HC245.

Display Board Component Placement - TR33 U11 74245



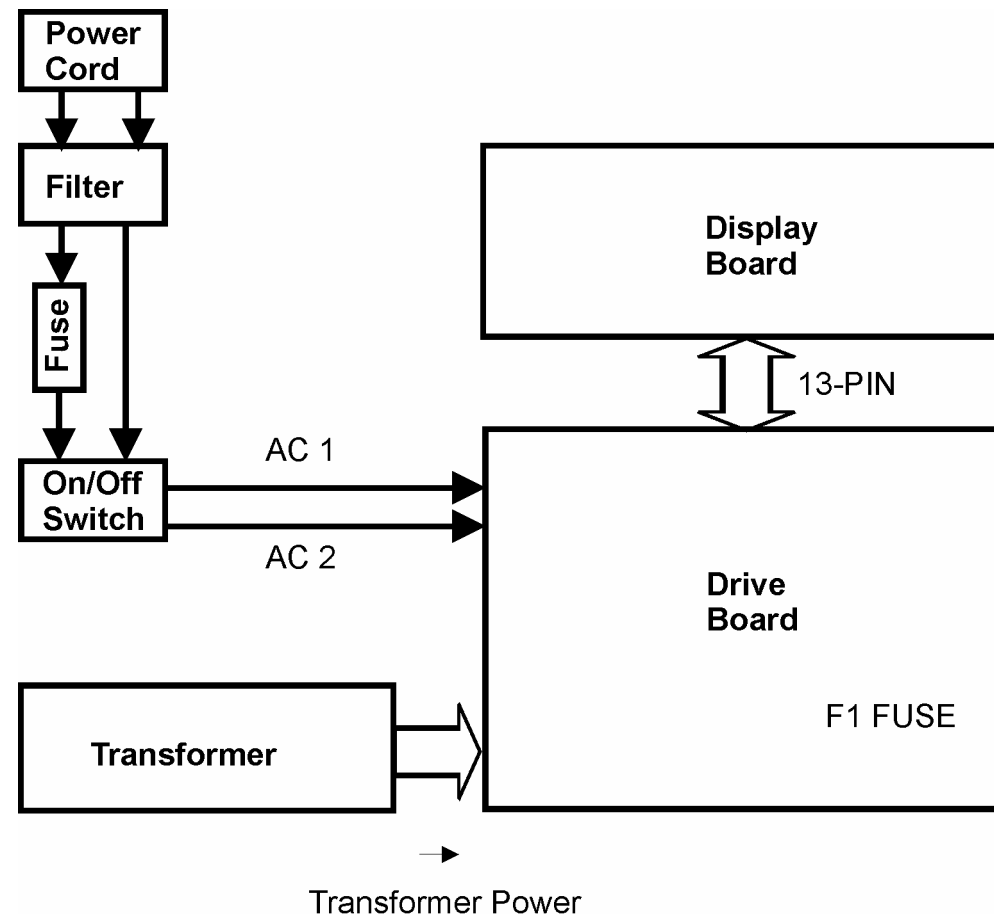
Display Component Placement - TR31/TR32 U11 74245



TR31/TR32/TR33 Error Messages: Unit Will Not Turn On

Circumstance of Malfunction: Turn on unit power. Display does not beep. Nor does it light up.

Block Diagram:



Operation

Step	Part	Operation
1	Power Cord	1. Provides power from the outlet.
2	Filter	1. Filters the power.
3	Fuse and Fuse Holder	1. Protects the unit. When current is excessive, the fuse breaks, shutting off the unit.
4	On/Off Switch	1. When the switch shows "0", the drive board receives no power. 2. When the switch shows "1", AC1, AC2 power goes to the drive board.
5	Transformer	1. Transformer reduces voltage for various drive board circuits.
6	Drive Board	1. After stabilizing power, the drive board provides VBB and VCC circuit power.
7	Data Cable	1. VBB circuit power travels the data cable to the display.
8	Display Board	1. VBB power is stabilized and becomes VCC power. 2. With VCC power, the display operates.

Possible Reasons for Malfunction

1. Drive board does not receive power and therefore cannot supply power to the display.
2. Drive board components have shorted out. The fuse is blown, so there is no power to the display.
3. Display receives no VBB voltage and cannot operate.
4. Display IC malfunction makes the display inoperable.

Troubleshooting

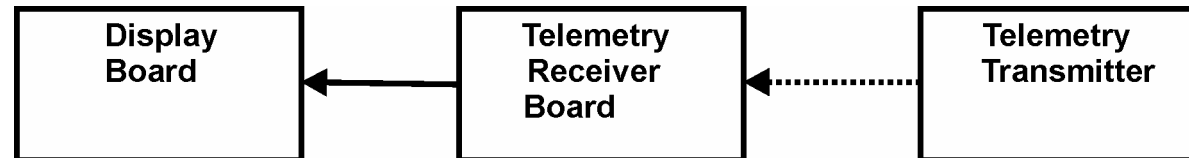
Step	Part	Troubleshooting
1	Power Cord	1. Inspect whether the power cord is connected properly.
2	Filter	2. Inspect whether the filter is connected properly.
3	Fuse and Fuse Holder	1. Inspect fuse connections. 2. Inspect fuse holder spring connection. 3. Inspect whether fuse is broken.
3	On/Off Switch	1. Inspect whether the LED in the on/off switch lights when the switch is set at "1". 2. If not lit, inspect the power cord and filter connections. 3. Replace the on/off switch as a test.
4	AC1, AC2 Wires	1. Inspect the AC1, AC2 wire connections.
5	Transformer	1. Inspect transformer wire connections. 2. Inspect the transformer output voltage.
6	Drive Board	1. Inspect whether the drive board LED2 POWER indicator lights. 2. If not, inspect whether AC1, AC2 wires are connected properly? 3. Inspect transformer connections. 4. Inspect drive board F1 fuse. 4. Inspect drive board CON2, CON3 connections.
7	Data Cable	1. Inspect the data cable connections from the drive board to the display board. 2. Inspect whether the data cable is crimped or broken.

Step	Part	Troubleshooting
8	Display Board	1. Inspect whether CON1 is connected properly. 2. Inspect whether LED1 POWER is lit. If not, replace U5 SK8051S. 3. If LED1 is lit, press on U6 IC to ensure pin contact.

TR31/TR32/TR33 Error Message: Telemetry Heart Rate Malfunction

Circumstance of Malfunction: 1. Telemetry strap is on but heart rate does not appear on display.
2. Telemetry heart rate reading and actual heart rate differ.

Block Diagram:



Operation

Order	Part	Operation
1	Telemetry Transmitter	1. Telemetry strap detects a pulse and transmits it to the receiver board.
2	Telemetry Receiver Board	1. The receiver board receives the signal and transmits it to the display.
3	Display Board	1. The display CPU detects the signal. 2. The heart rate value appears on the display.

Possible Reasons for Malfunction

1. Battery voltage in the strap is too low or the strap is defective.
2. Receiver is defective and does not receive the signal.
3. Receiver receives interference.
4. Receiver wires are not connected properly.
5. Display is defective; the CPU fails to detect a signal.

Troubleshooting

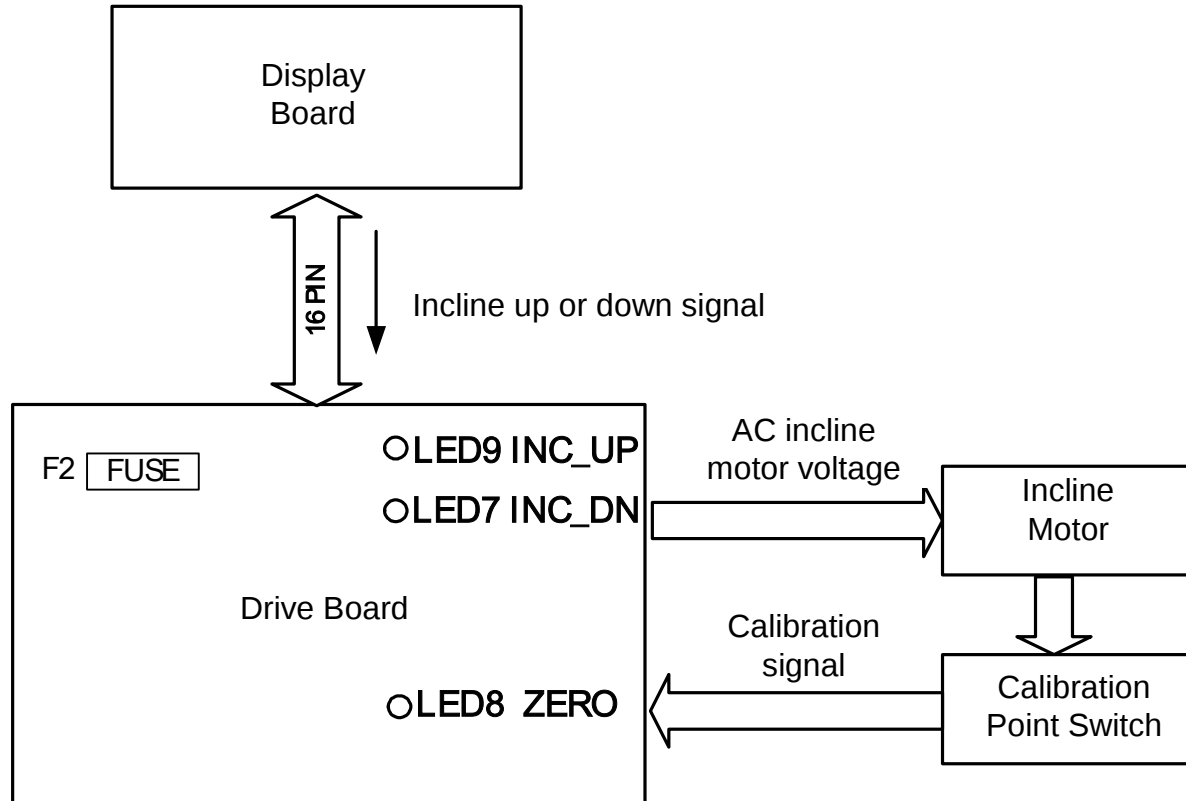
Order	Part	Troubleshooting
1	Telemetry Transmitter	1. Inspect usage: Wet the chest to improve reception. Place strap properly. 2. Replace the transmitter strap and test.
2	Telemetry Receiver Board	1. Inspect position of the receiver board. 2. Inspect receiver component soldering.

Step	Part	Troubleshooting
3	3-pin Wire	1. Inspect wire connections.
4	Display	1. Press on U6 IC to ensure connections.

TR31/TR32/TR33 Error Messages: Incline Does Not Operate

Circumstance of Malfunction: Press the incline up or down key; numbers on the display change but the incline does not operate up or down.

Block Diagram:



Operation

Order	Part	Explanation
1	Display Board	1. Press INCL<▲> or INCL<▼>. The incline window shows the incline value. 2. The CPU emits the incline up or down signal to the drive board.
2	Data Cable	1. The incline up or down signal travels the data cable to the drive board.
3	Drive Board	1. Press INCL<▲> key. LED9 (INC_UP) on the drive board lights. Press the INCL<▼> key. LED7 (INC_DN) on the drive board lights. 2. When LED9 (INC_UP) lights, the drive board emits AC voltage, making the incline motor operates upward. 3. When LED7 (INC_DN) lights, the drive board emits AC voltage, making the incline motor operate downward.
4	Incline Motor	1. When the drive board INC_UP LED lights, the incline motor operates upward. 2. When the drive board INC_DN LED lights, the incline motor operates downward.

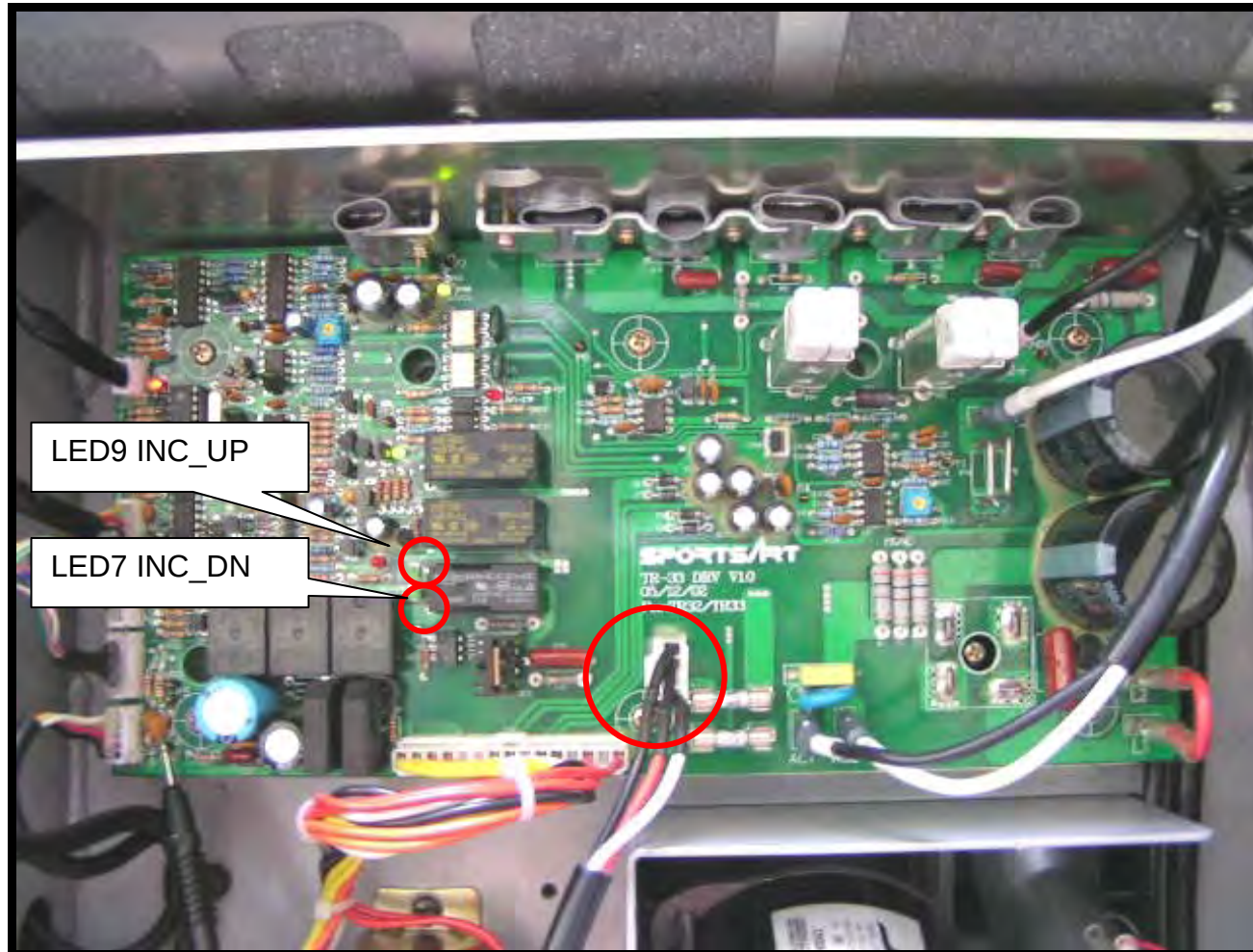
Possible Reasons for Malfunction

1. The display board did not emit the INCL UP or DN signal to the drive board.
2. The cable is either an electrical “open” or “short.”
3. A component on the drive board is malfunctioning. The drive board cannot emit AC voltage to the incline.
4. The incline motor has an electrical “open” and cannot operate properly.

Inspection Points

Order	Part	Troubleshooting
1	Incline Motor	1. Inspect whether the incline motor has an electrical “open.”
2	Drive Board	1. Inspect whether cables are connected properly to the drive board. 2. Inspect the incline fuse on the drive board, F2 3A. If broken or burnt, replace it. 3. Inspect whether the drive board is emitting voltage to the incline motor. When INC_UP or INC_DN LEDs light, there should be voltage. If not, replace K5 RELAY on the drive board. 4. Inspect whether component Q15 BT137 on the drive board is burnt. 5. Replace the following drive board components and test the unit: U15 MOC3061, Q13 A1015, Q16 C1815, U11 ULN2003, U14 PIC16F628A.
3	Data Cable	1. Inspect cable connections. 2. Inspect whether the cable is pinched or broken. 3. Replace the cable.
4	Display Board	1. Test the display by pressing INCL<▲>/<▼> keys. After the display incline values change, the drive board INC_UP or INC_DN LED should light. 2. Press or replace the program IC U6 SM8958A and test the unit. 3. Replace U2 40106 and test the unit.

Test for Incline Motor Voltage at the Drive Board



Test Procedure

1. Set voltmeter to the AC 600 V setting. Place the red probe on CON6-WHITE wire pin (common).
To test voltage for upward movement, place the black probe on the CON6-BLACK wire pin.
To test voltage for downward movement, place the black probe on the CON6-RED wire pin.
2. Turn on the power switch. Operate the unit normally.
3. Press the INCL<▲> key. The INC_UP LED on the drive board lights. Normal reading: 108~110V (220V: 215~220V).
Incline operates up.
4. Press the INCL<▼> key. The INC_DN LED on the drive board lights. Normal reading: 108~110V (220V: 215~220V).
Incline operates down.
5. If there is no voltage, replace the drive board.

Inspection Points

Press the INCL<▲> key. The INC_UP LED on the drive board lights. CON6 emits VAC. If not, inspect:

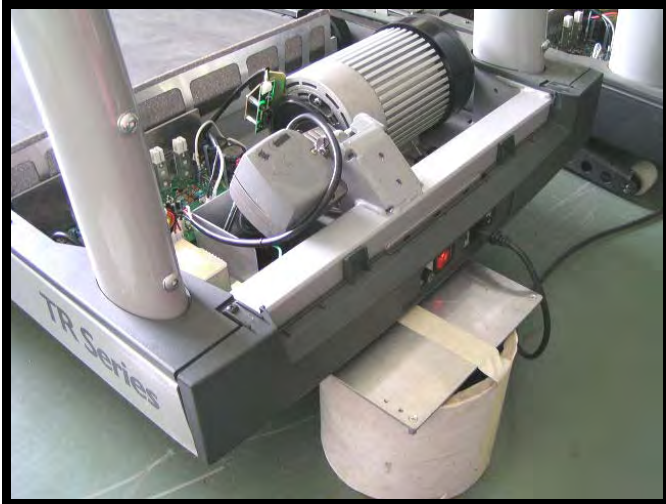
1. Whether LED9 on the drive board lights
2. Whether K5 RELAY on the drive board activates
3. F2 3A fuse and its connection
4. Whether Q15 BT137 has burnt

Press the INCL<▼> key. The INC_DN LED on the drive board lights. CON6 emits VAC. If not, inspect:

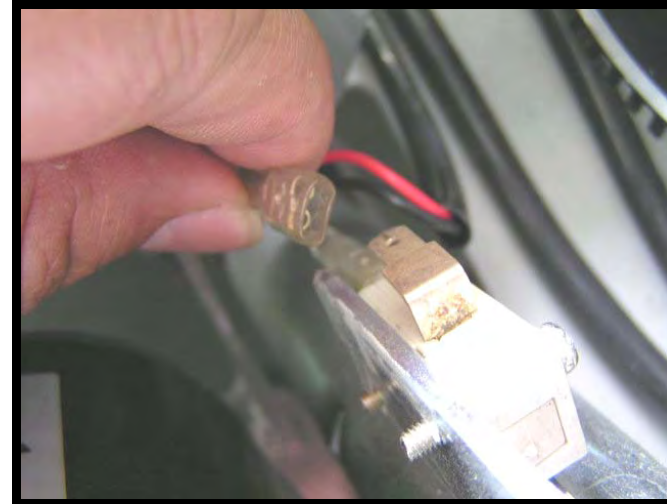
1. Whether LED7 on the drive board lights
2. Whether K5 RELAY on the drive board activates
3. F2 3A fuse and its connection
4. Whether Q15 BT137 has burnt

Incline Calibration Procedure

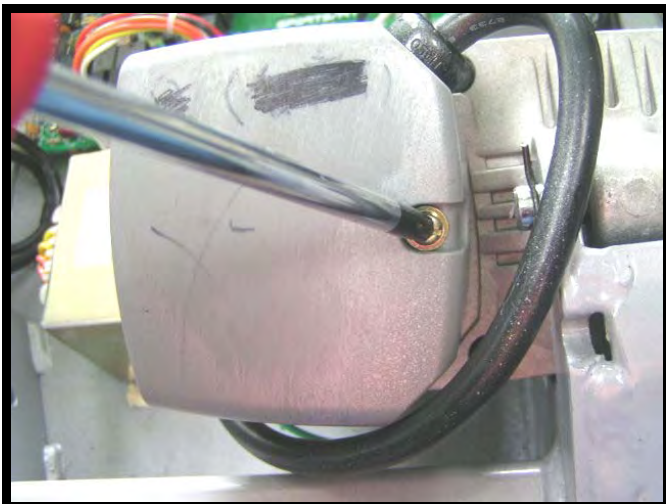
1. Support the front of the frame.



2. Remove incline calibration point wires.



3. Remove the incline motor cover.



4. Press the INC DN key until the incline goes to the lowest level and stops, then turn off unit power.

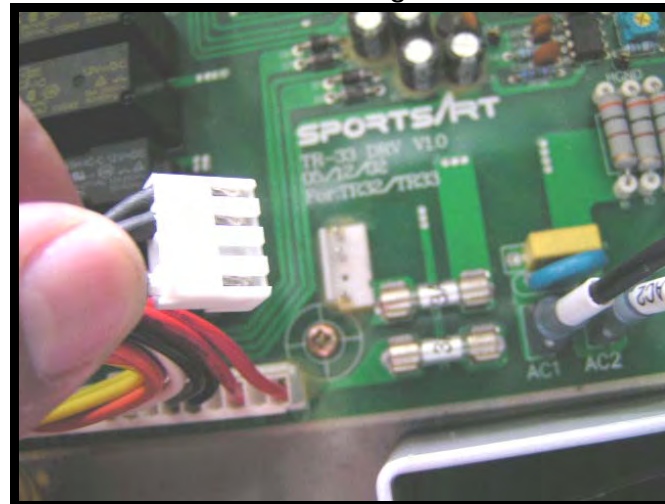


SportsArt_{FITNESS}

5. When the incline declines completely, the switch activates.



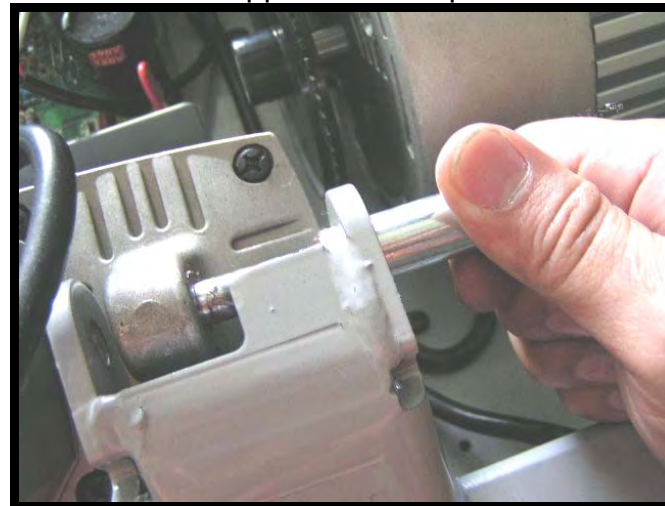
6. Remove CON6 and the ground wire.



7. Remove the lower incline clip and axle.



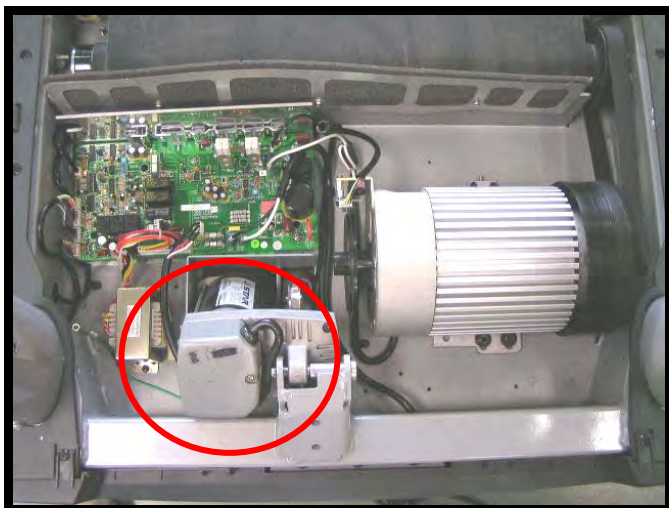
8. Remove the upper incline clip and axle.



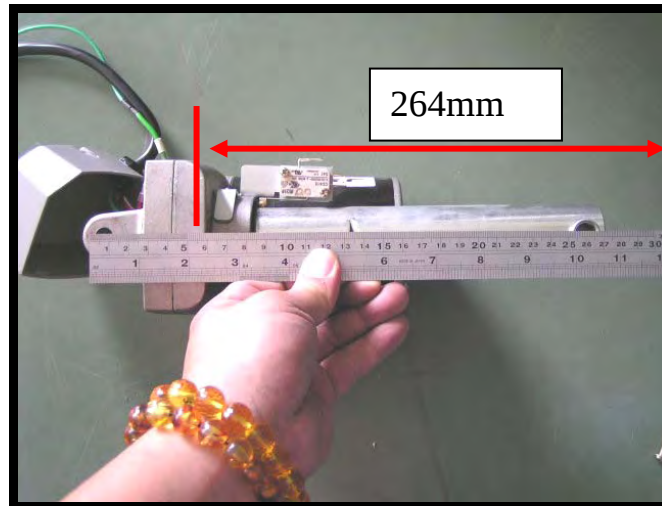
9. Remove the AC incline motor set.



11. Install the incline set and connect wires.



10. Set holes to a distance of 264mm.



12. Press INC UP to 2%. Then press INC DN to 0% to set calibration.



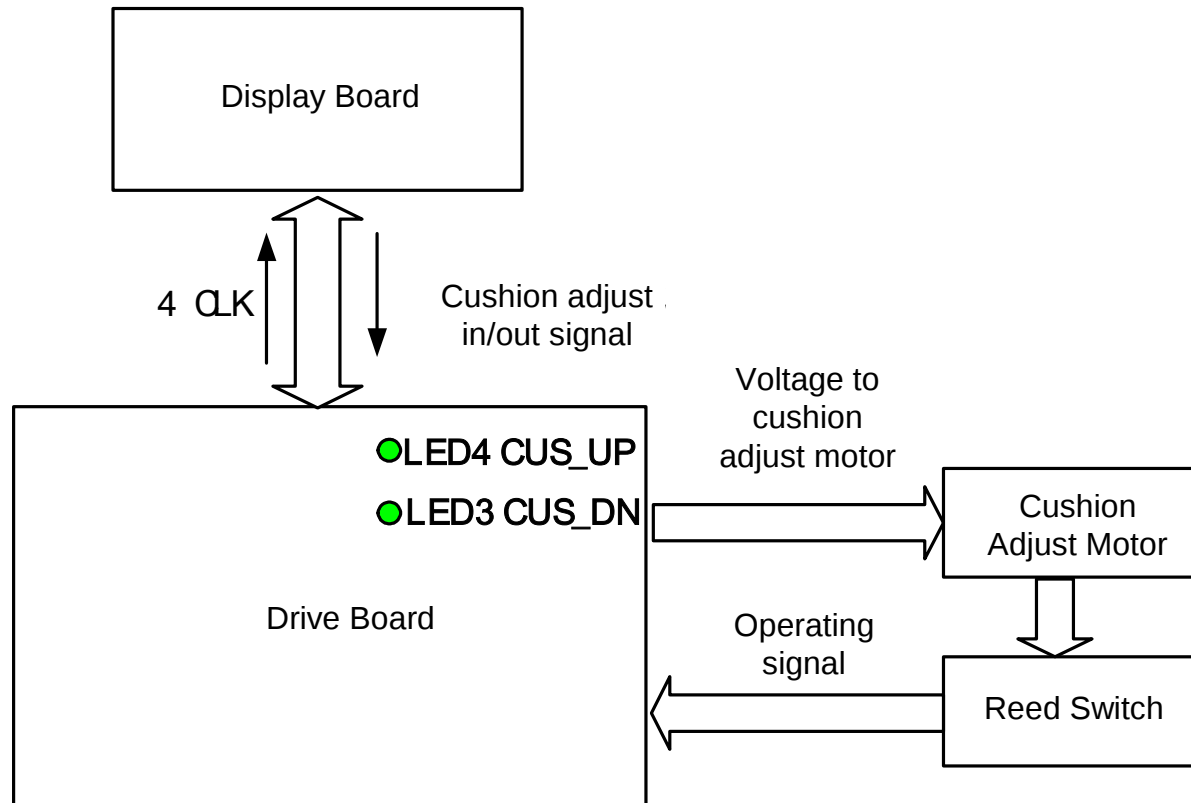
13. Test the calibration

- (1) Press INCL<▲> until the INC window shows 15%. LED9 on the drive board lights while the incline moves. When the incline stops moving, LED8 on the drive board does not light.
- (2) Press INCL<▼> until the INC window shows 0%. LED7 on the drive board lights while the incline moves. When the incline stops moving, LED8 on the drive board lights.
- (3) On the drive board, LED8 ZERO lights to indicate that incline calibration is complete.

TR33 Error Messages: Cushion Adjustment Does Not Operate

Circumstance of Malfunction: Press the Cushion Firm/Soft key. The cushion adjustment motor does not operate.

Block Diagram:



Operation

Order	Part	Explanation
1	Display Board	1. Press the CUSHION FIRM or SOFT key. Display CUSHION window shows the value of the cushion setting. 2. The CPU emits the CUS_UP or CUS_DN signal to the drive board.
2	Data Cable	1. The CUS_UP or CUS_DN signal travels the data cable to the drive board.
3	Drive Board	1. Press the CUSHION FIRM key. LED4 on the drive board lights. Press the CUSHION SOFT key. LED3 on the drive board lights. 2. When LED4(CUS_UP) lights, the drive board emits 22 VDC to the cushion adjustment motor. 3. When LED3(CUS_DN) lights, the drive board emits 22 VDC to the cushion adjustment motor.
4	Cushion Adjustment Motor	1. When LED4(CUS_UP) lights, the cushion adjust motor extends outward. 2. When LED3(CUS_DN) lights, the cushion adjust motor retracts inward.

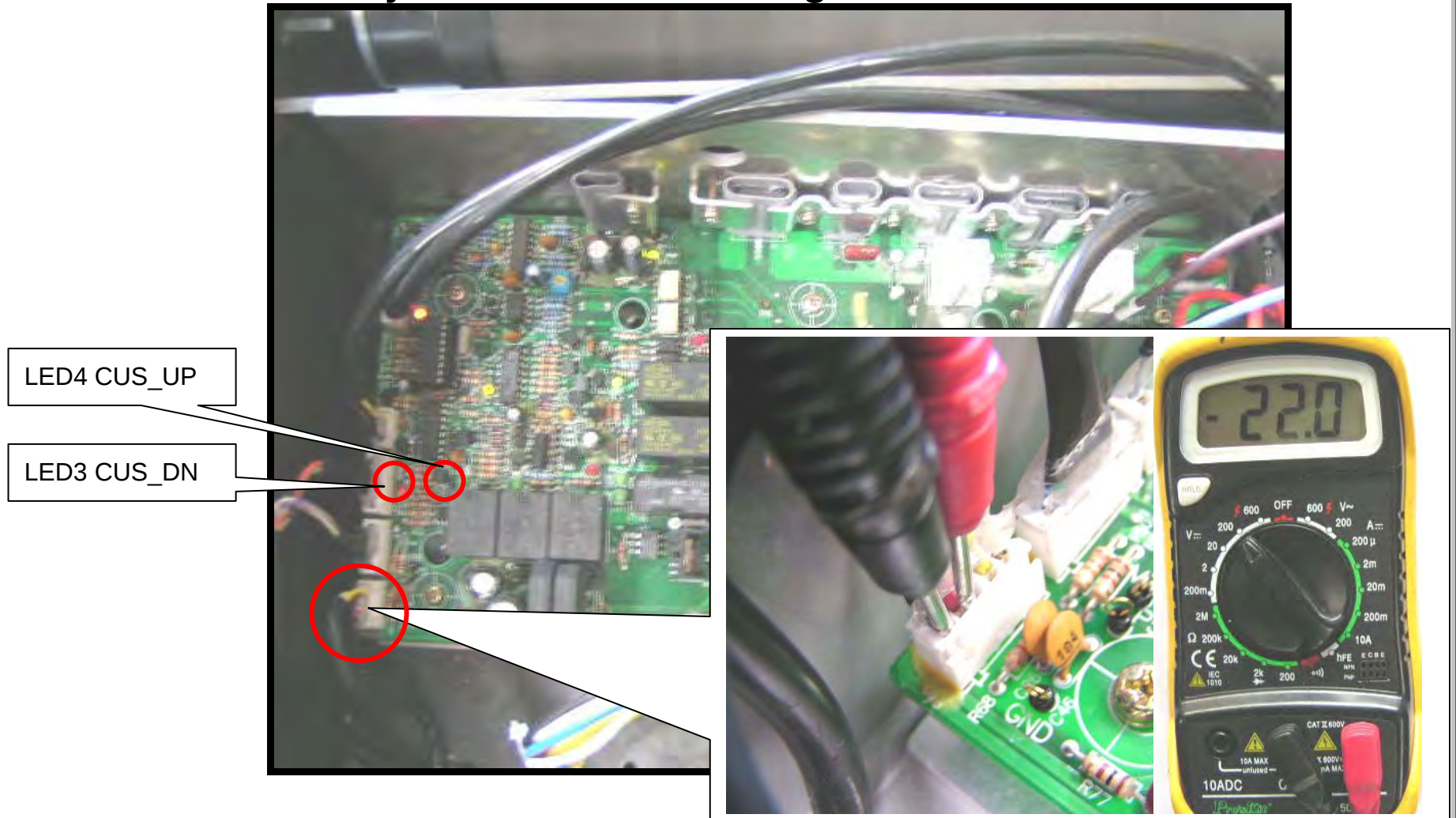
Possible Reasons for Malfunction

1. The display board did not emit the CUS_UP or CUS_DN signal to the drive board.
2. The cushion adjustment motor wires are electrical "opens" or "shorts."
3. Drive board component failure means no DC voltage is emitted to the cushion adjustment motor.
4. The cushion adjustment motor is an electrical "open" and cannot operate.

Inspection Points

Order	Part	Troubleshooting
1	Cushion Adjustment Motor	1. Inspect whether the cushion adjustment motor is an electrical “open.”
2	Drive Board	1. Inspect whether wires to the drive board are connected properly. 2. Inspect voltage to the cushion adjustment motor. There should be voltage when CUS_UP or CUS_DN LEDs light. If not, either BD2 KBU1006, K4(UP) or K6 (DN) RELAY is defective. 3. Replace Q14 A1015, Q16 C1815, U11 ULN2003, or U14 PIC16F628A on the drive board and test unit operation.
3	Data Cable	1. Inspect connections. 2. Inspect whether the data cable is pinched or broken. 3. Replace the data cable and test unit operation.
4	Display Board	1. Inspect whether after the CUSHION<FIRM>/<SOFT> LED operates, the drive board CUS_UP or CUS_DN LED lights. 2. Press on or replace program IC U6 SM8958A. 3. Replace U2 40106 and test.

Test for Cushion Adjustment Motor Voltage at Drive Board



Test Procedure

1. Put multi-meter to the DC 200V setting. Place the red probe on the CON4-RED wire pin. Place the black probe on the CON4-BLACK wire pin.
2. Turn on the power. Operate the unit normally.
3. Press the CUSHION <FIRM> key. LED4 CUS_UP on the drive board lights. Normal reading: -22 VDC. Motor worm gear extends outward.
4. Press the CUSHION <SOFT> key. LED3 CUS_DN on the drive board lights. Normal reading: 22 VDC. Motor worm gear retracts inward.
5. If there is no voltage, the drive board is defective.

Inspection Points

Press CUSHION <FIRM>. The drive board CUS_UP LED lights. CON4 emits DC voltage. If not, inspect:

1. whether LED4 lights
2. whether K6 RELAY activates
3. whether BD2 KBU1006 is burnt
4. replace U11 ULN2003 and test

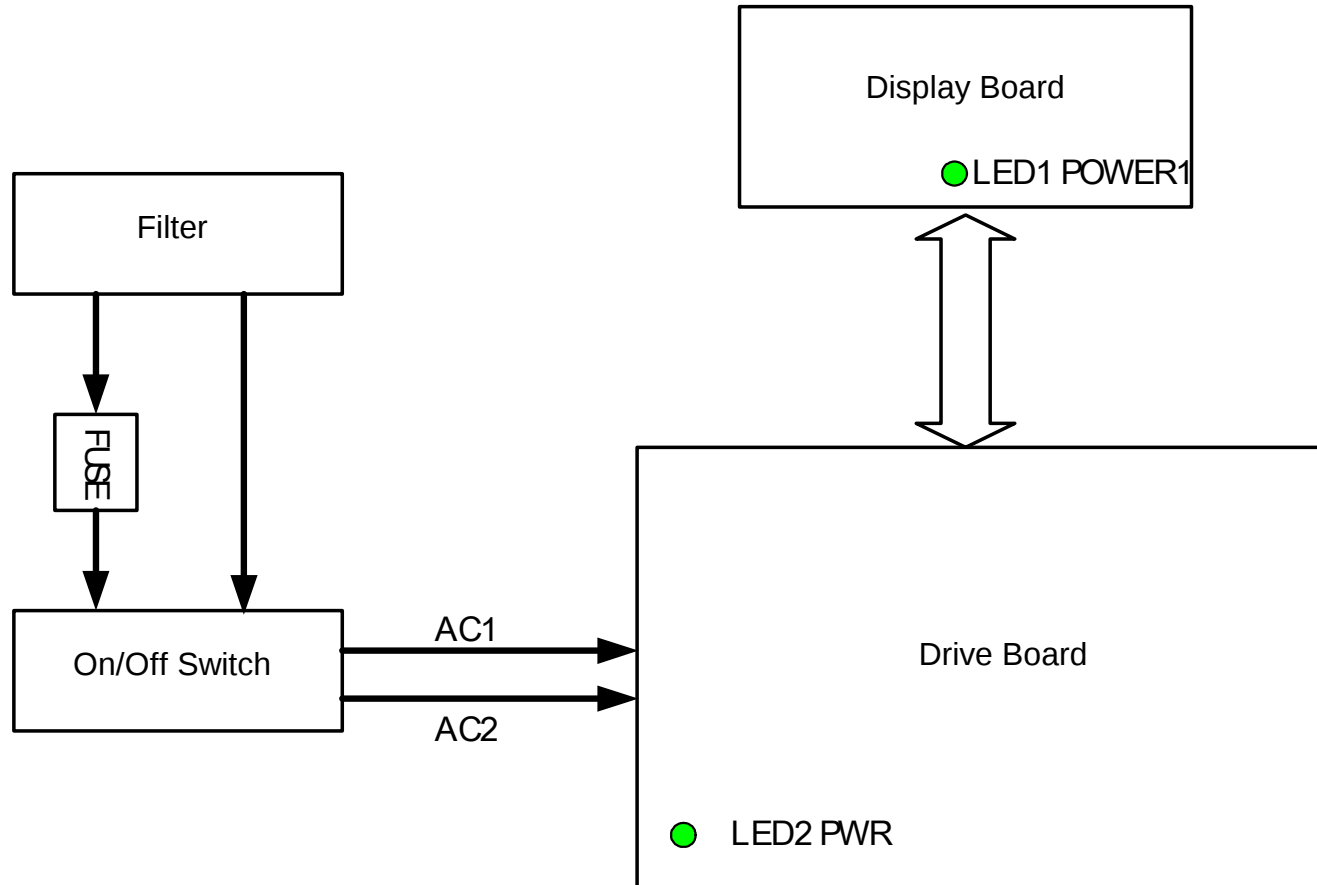
Press CUSHION <SOFT>. The drive board CUS_DN LED lights. CON4 emits DC voltage. If not, inspect:

1. whether LED3 lights
2. whether K4 RELAY activates
3. whether BD2 KBU1006 is burnt
4. replace U11 ULN2003 and test

TR31/TR32/TR33 Error Messages: Main Fuse Blows

Circumstance: Main fuse has blown. Turn on power; display LEDs do not light up. Replace the fuse. The fuse blows again.

Block Diagram:



Operation

Order	Part	Explanation
1	Filter	1. Voltage goes from the power outlet into the unit past the filter.
2	Fuse and Fuse Holder	1. When the drive board or other components malfunction, the fuse breaks.
3	On/Off Switch	1. Flip the switch to "1" (on). Voltage travels to the drive board.
4	Drive Board	1. If electronic components operate properly, the display operates normally. 2. If electronic components do not operate properly, the drive board can short out electronically.

Possible Reasons for Malfunction

1. When motor current is too high, the fuse blows.
2. When wires are not connected properly, increasing current draw, drive board components burn.
3. When drive board components fail, the fuse blows as soon as the unit is turned on.

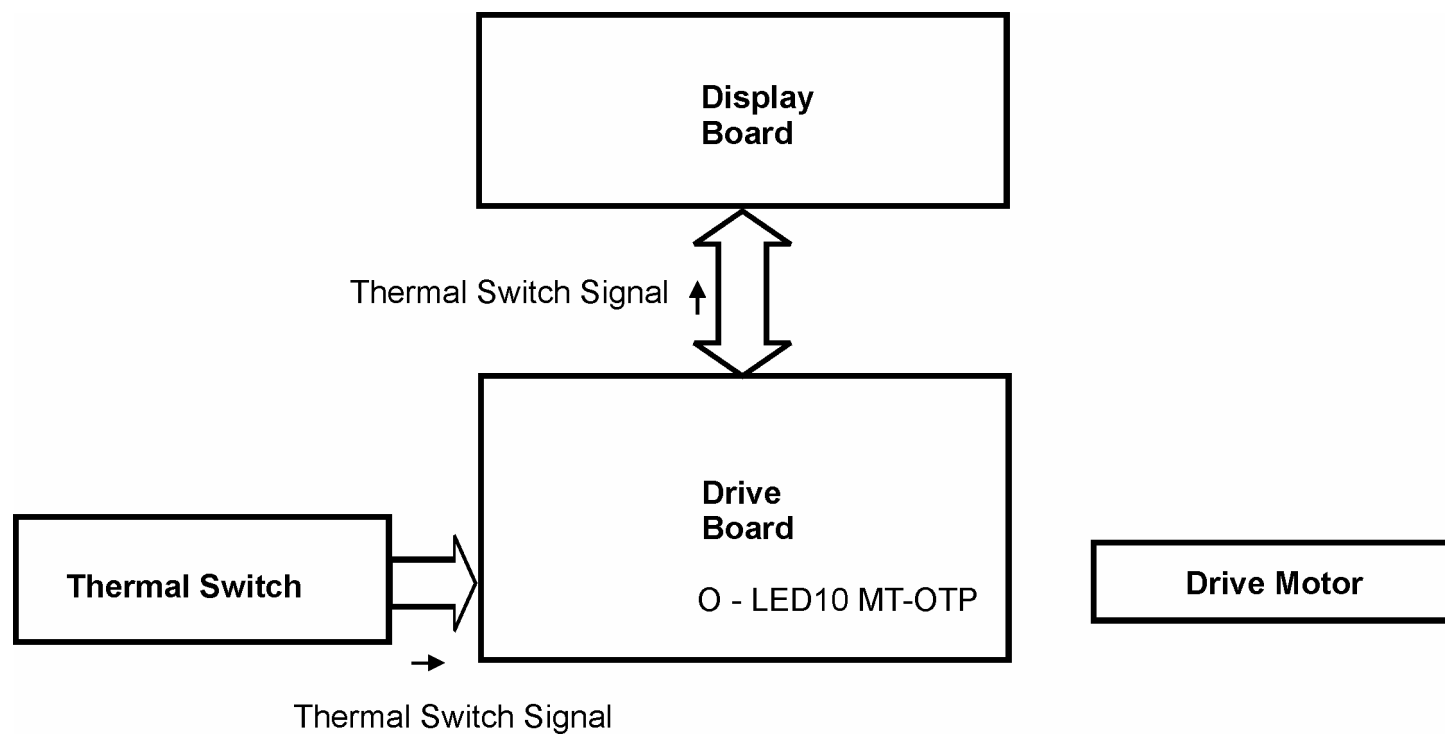
Inspection Points

Order	Part	Troubleshooting
1	Filter	1. Inspect whether the filter is connected properly.
2	Fuse and Fuse Holder	1. Inspect the fuse to ensure that fuse specifications match. 2. Inspect wiring to the fuse.
3	On/Off Switch	1. Inspect switch wiring connections.
4	Drive Board	1. Inspect wire connections to the drive board. 2. Inspect the bridge rectifier on the drive board for an electrical "short." 3. Inspect the IGBT on the drive board for an electrical "short." 4. Replace the drive board.

TR31/TR32/TR33 Error Messages: Service Required

Definition: Motor overheats. Service required message appears on the display.

Block Diagram:



Operation

Order	Part	Operation
1	Thermal Switch	1. Motor is not excessively hot, but the thermal switch “shorts” out. 2. Motor is excessively hot, thermal switch becomes an electrical “open”.
2	Drive Board	The thermal switch signal goes to the drive board.
3	Data Cable	1. The signal travels to the display board.
4	Display Board	1. The display CPU detects the motor thermal switch signal. 2. If “open,” the display shows Service Required and beeps.

Possible Reasons for Malfunction

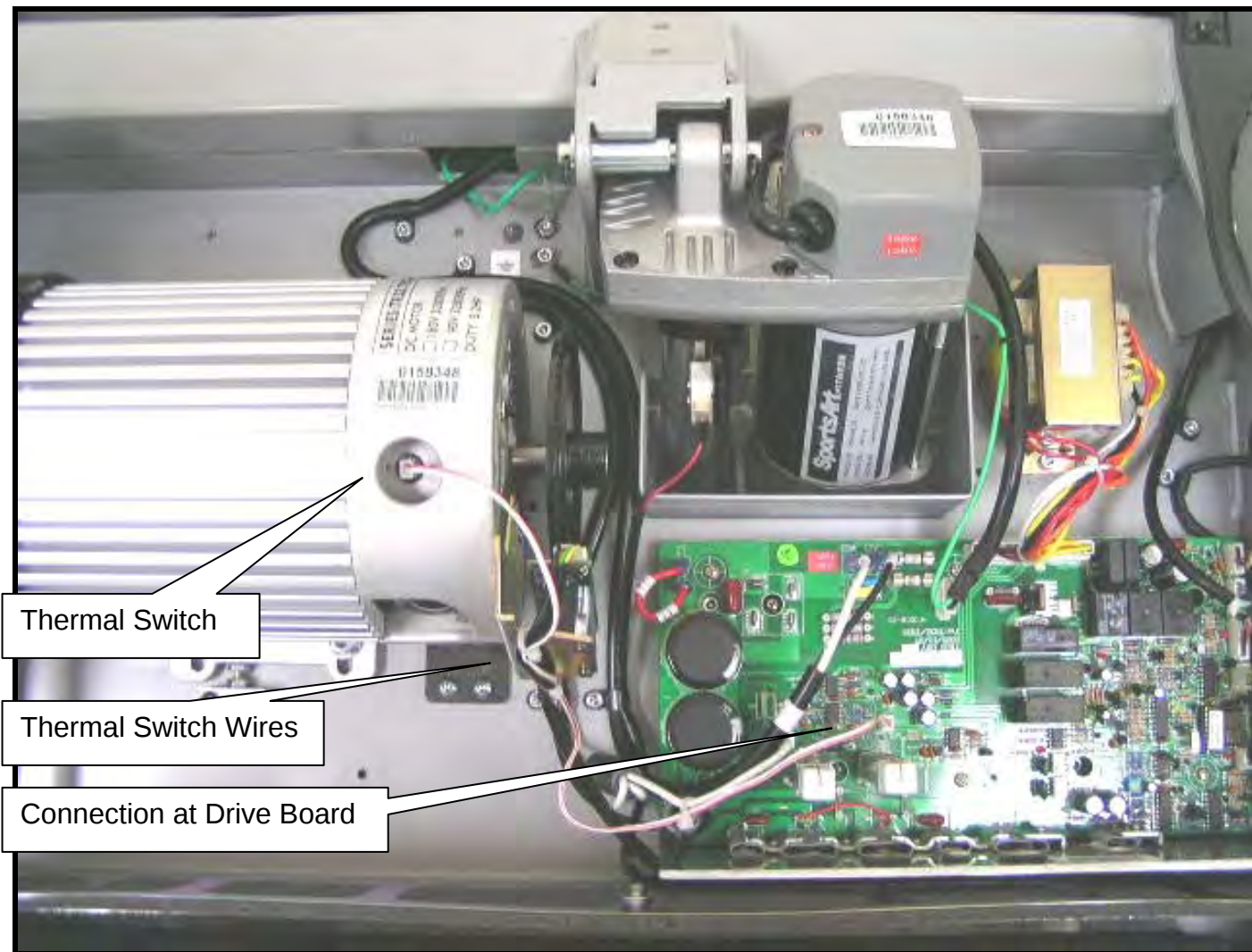
1. Walk belt wear raises the amp draw.
2. Motor malfunction makes amperage is too high.
3. Walk belt is too tight or too loose.
4. Motor thermal switch wire is not connected properly.
5. Motor thermal switch is overly sensitive.
6. Excessive use. Let motor cool 30 minutes.

Troubleshooting

If the display often shows the Service Required message, please inspect the following:

Step	Part	Troubleshooting
1	Walk Belt	1. Adjust walk belt tightness. 2. Inspect walk belt for wear. Replace if necessary.
2	Walk Deck and Rollers	1. Clean the walk deck and the rollers.
3	Motor	1. Inspect the thermal switch wire connections. 2. When Service Required appears, inspect the motor temperature. If the motor is hot, inspect the belt, deck and motor. 3. Inspect motor brushes for irregular wear. Replace if necessary. 4. Replace the motor.
4	Drive Board	1. Inspect the motor thermal fuse connections at the drive board.

Thermal Switch and Wire Test



Inspection Procedure

1. When the motor is not hot, turn unit on. Display should not show Service Required.
2. If motor is hot, display should show Service Required.

Troubleshooting

If motor is not hot but the display says Service Required, inspect:

1. Thermal switch wire connections at the motor.
2. Thermal switch wire connections at the drive board.
3. Thermal switch.

If motor is hot, inspect:

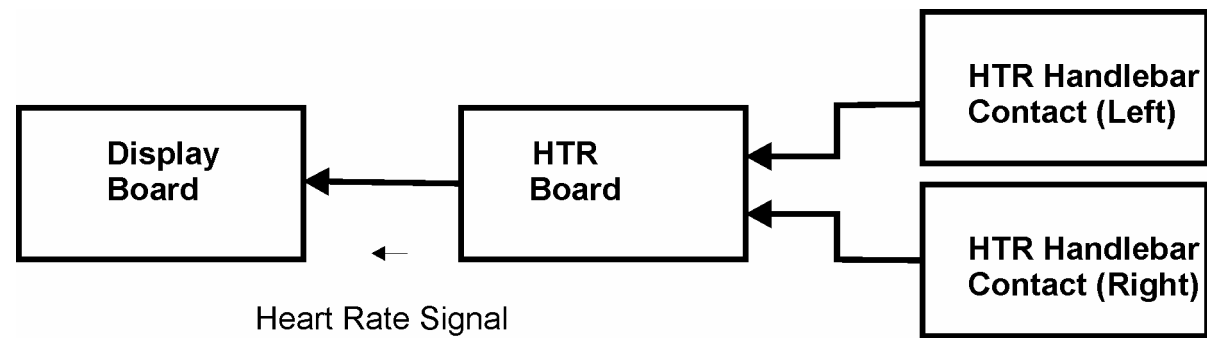
1. Walk belt and drive belt tension.
2. Walk belt wear.
3. Front and rear roller, deck and belt for cleanliness.
4. Motor brush wear.
5. Replace motor as a test.

HTR Malfunction

Circumstance of Malfunction:

1. Hold onto the HTR handlebars. Display does not show heart rate value.
2. Do not hold onto HTR handlebars. Display shows heart rate value.

Block Diagram:



Operation

Order	Part	Operation
1	HTR Handlebar	1. Grip the HTR contacts with both hands. 2. Contacts detect the human heart rate.
2	HTR Wires	1. Signals from the grips travel to the HTR board.
3	HTR Board	1. The HTR board detects heart rate signal. 2. The HTR board sends the heart rate signal to the display.
4	3-pin Wires	1. The signal travels from the HTR board to the display board.
5	Display Board	1. Display board CPU detects the signal. 2. Heart rate appears on the display.

Possible Reasons for Malfunction

1. HTR contacts or wires are bad. The HTR board does not receive any signal.
2. HTR board cannot read the signal.
3. Display CPU does not detect HTR signal.

Troubleshooting

Step	Part	Troubleshooting
1	HTR Handlebar	1. Clean HTR contacts. 2. Test HTR wires.
2	HTR Wires	1. Inspect whether the HTR wires are crimped or broken. 2. Test HTR wires.
3	HTR Board	1. Inspect HTR board incoming signal detection LED. 2. If LED2 does not light, inspect HTR wires or contacts. 3. If LED2 lights but LED3 does not light, replace the HTR board. 4. If LED2 lights, LED4 flashes, but there is no output, replace the HTR board. 5. If you don't hold HTR contacts but LED4 flashes, replace the HTR board.
4	Wires	1. Inspect the wire connections.
5	Display Board	1. Press on IC U4 to ensure good connections.

TR31/TR32/Tr33 Treadmill Repair Manual

Chapter 7

7-0-0 Component Testing

7-1-1 EMI Filter Test (Continued to 7-1-3)

7-1-2 Motor Test

7-3-1 Transformer Test (Continued to 7-3-2)

7-4-1 Inductor Test

7-5-1 Drive Motor Voltage Test at Drive Board (Continued to 7-5-2)

7-6-1 Drive Board IGBT Test (Continued to 7-6-2)

7-7-1 Drive Board VCC Power Test (Continued to 7-7-2)

7-8-1 Drive Board Incline Motor Power Test

7-9-1 Incline Limiter Switch Test (Continued to 7-9-2)

7-10-1 TR33 Drive Board Cushion Motor Voltage Test (Continued to 7-10-2)

7-11-1 TR33 Cushion Motor Limit Switch Test (Continued to 7-11-2)

7-12-1 Optic Sensor Signal Test - (Continued to 7-12-2)

7-13-1 Optic Sensor Signal Test – LED (Continued to 7-13-2)

7-14-1 Safety Key Test (Continued to 7-14-2)

7-15-1 AC Incline Motor Resistance Test (Continued to 7-15-3)

7-16-1 Keypad Test (Continued to 7-16-2)

7-17-1 Display Board VBB Circuit Test (Continued to 7-17-2)

7-18-1 Display Board VCC Circuit Test (Continued to 7-18-2)

7-19-1 Telemetry Heart Rate Test (Continued to 7-19-2)

7-20-1 HTR Board LED Indicators (Continued to 7-20-2)

7-21-1 HTR System Continuity Test

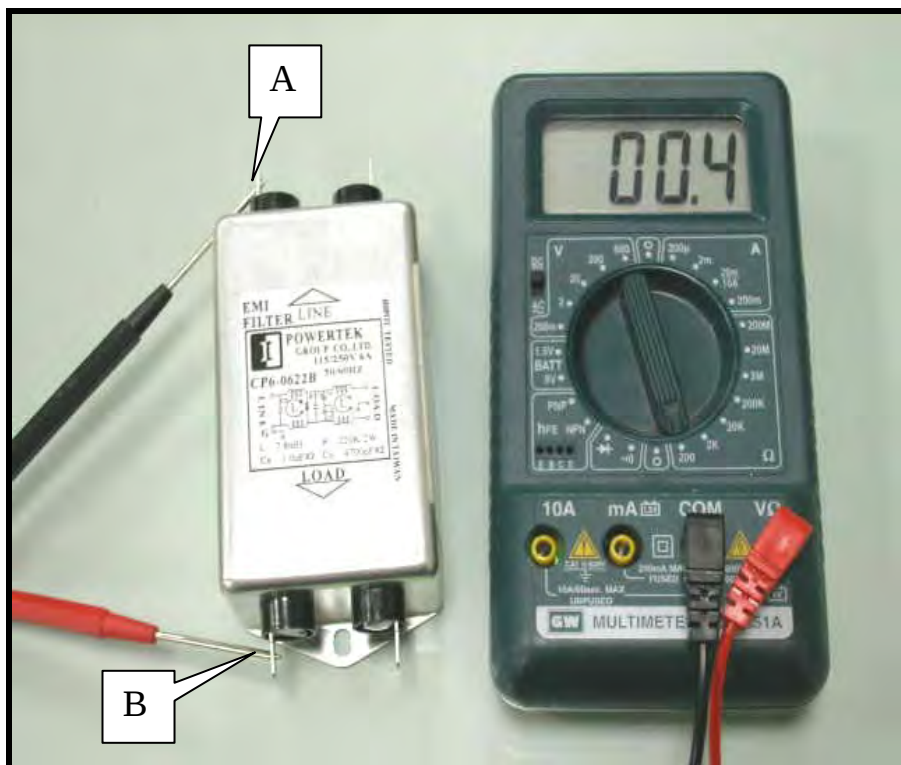
7-22-1 TR33 Display Board U6 IC

7-22-2 TR31 and TR32 display Board U6 IC

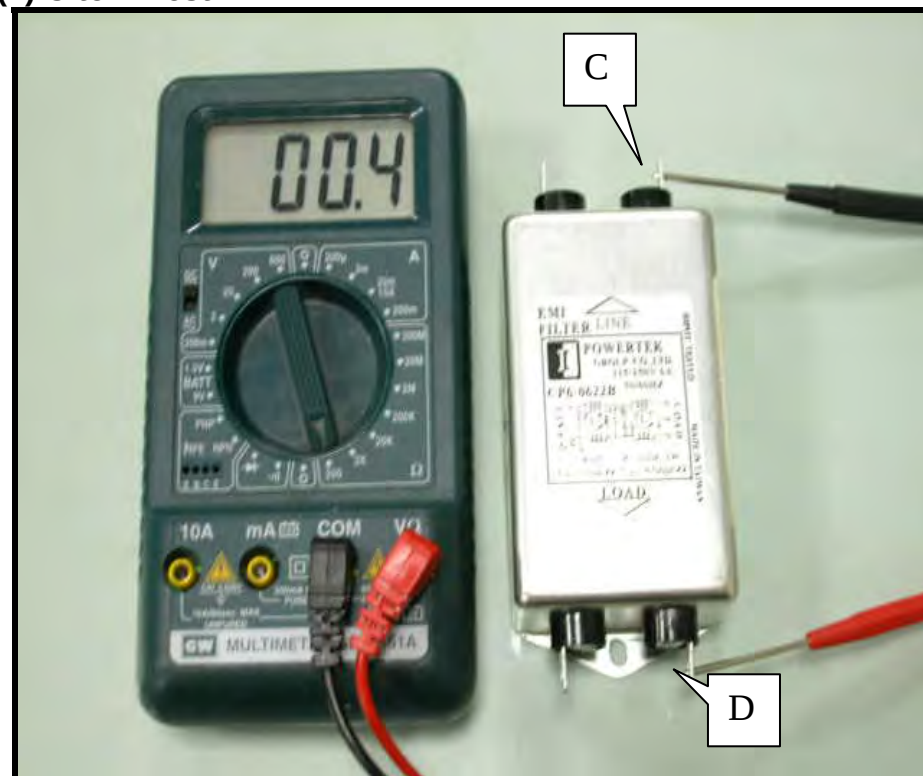
7-22-3 Drive Board LED6 MC Indicator

EMI Filter Test

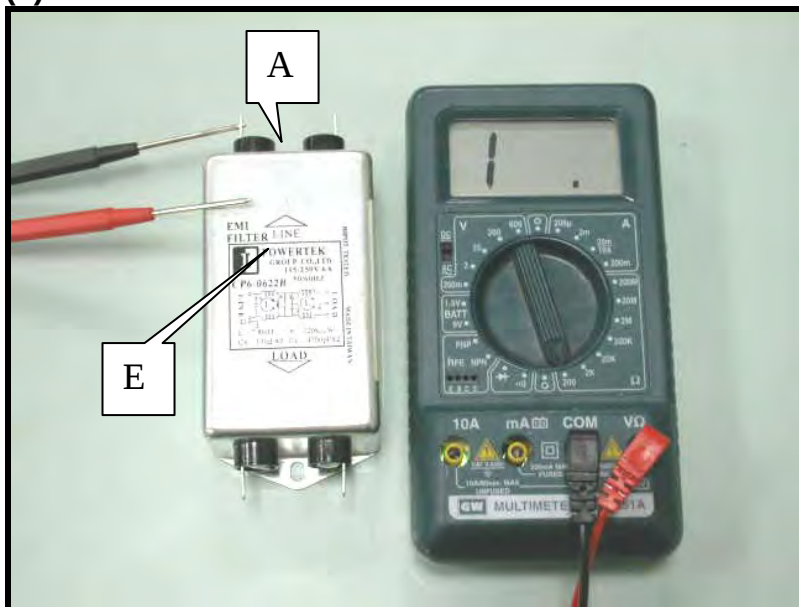
(1) A to B Test



(2) C to D Test



(3) A to E Test



Test Procedure

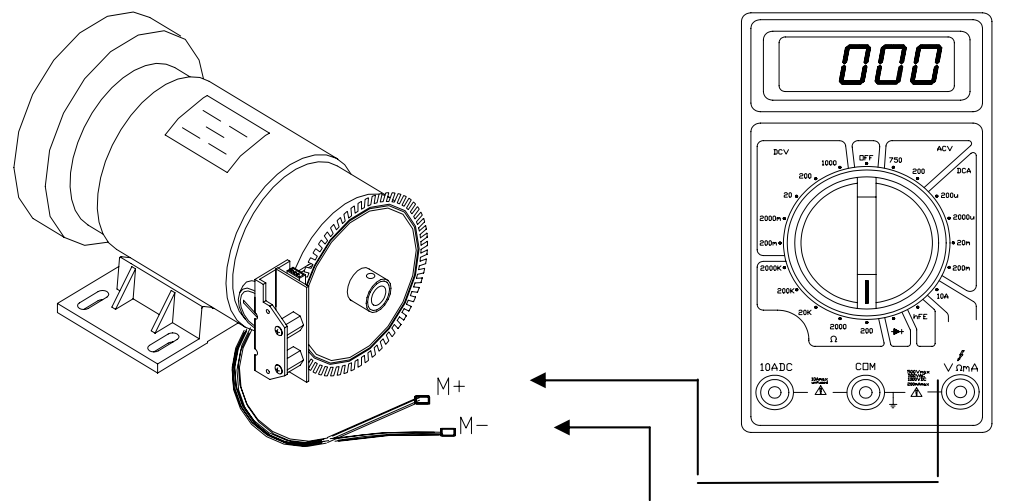
1. Remove wires from the filter.
2. Set voltmeter to the 200 ohm setting. Place probes as indicated.
3. Normal test results are shown below.

Test	Points	Normal Reading	Explanation
1.	A-B	0 (continuity)	There should be continuity. OL means the line connection is broken.
2.	C-D	0 (continuity)	There should be continuity. OL means the line connection is broken.
3.	A-E	1 or OL (open line)	OL open line is normal. Continuity here indicates a short.

Troubleshooting

1. Continuity test: If there is not continuity during the A-B and C-D tests, the filter is bad. Replace it.
2. Open test: If there is a short across A-E, the filter is bad. Replace it.

Motor Test

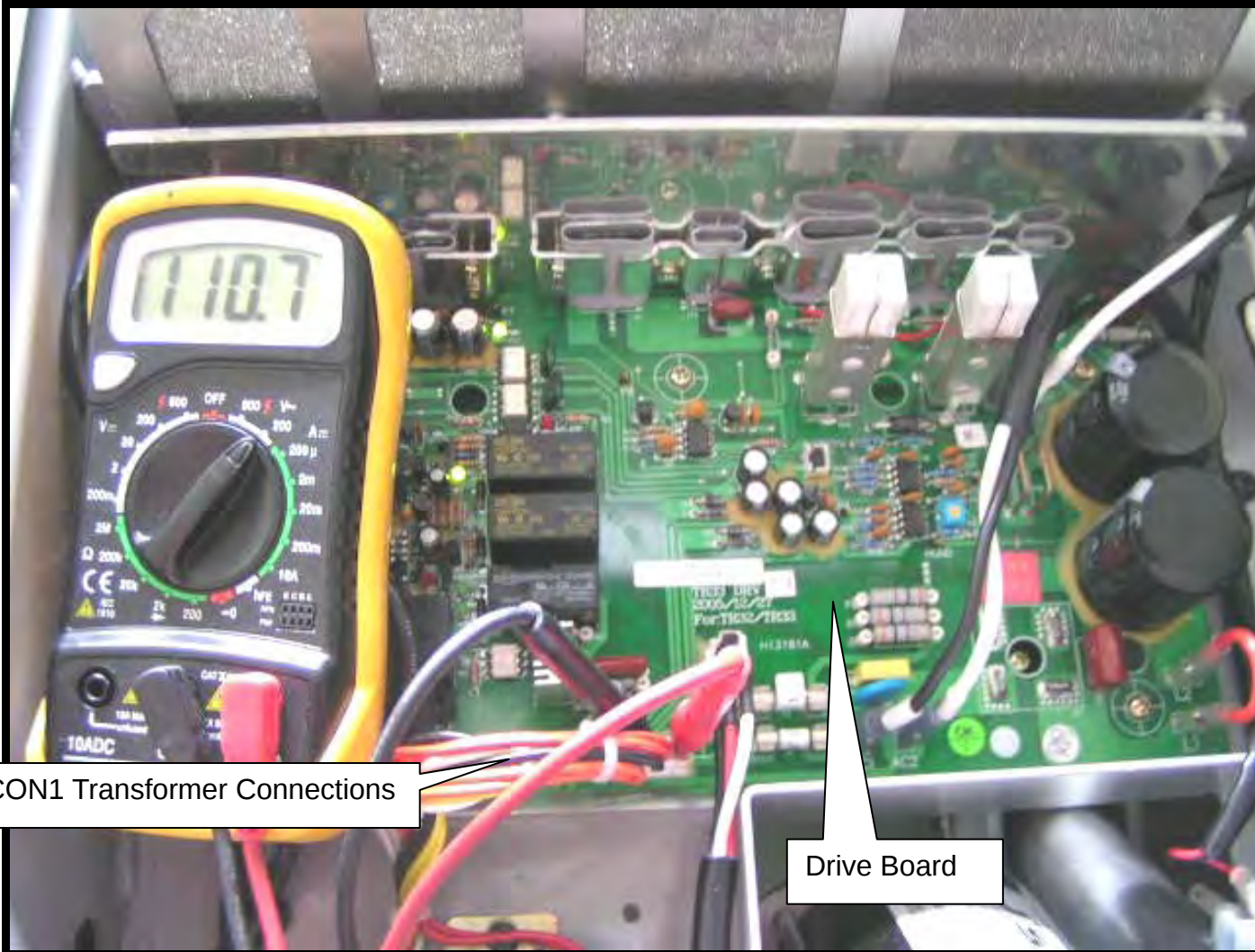


Test Procedure

1. Remove motor M+, M- wire connections from the drive board.
2. Set multimeter to the 200 VDC setting. Place probes on the M+, M- wire connectors.
3. Rotate the motor. Motor should produce voltage.

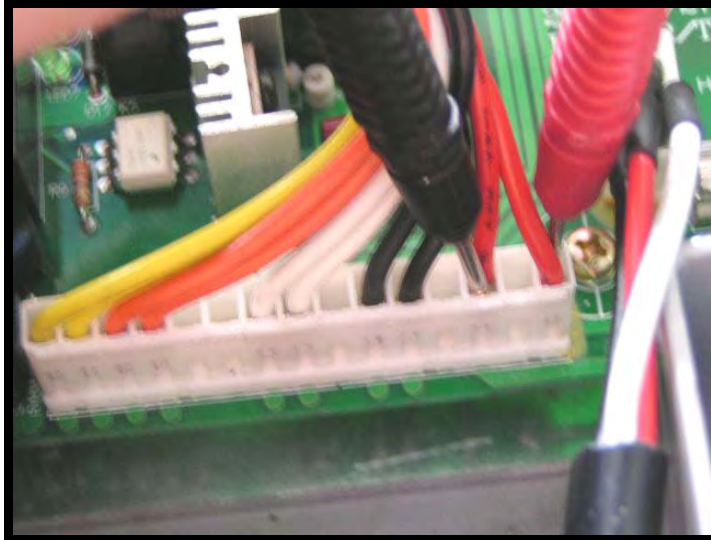
If there is no voltage, the motor has an electrical “open.” Inspect the motor brushes and commutator.

Transformer Test



Test Procedure

1. Inspect transformer wire connections at the drive board CON1 connector.
2. Set multi-meter to the AC 200V setting.
3. Turn on unit power. Place multi-meter probes on the connector for the transformer's two red wires (or two blue wires on a 220V unit) as shown.
4. Normal reading: AC 110V North America (or 220V Europe).
5. Test secondary (output) voltages in order. Note normal specifications below.

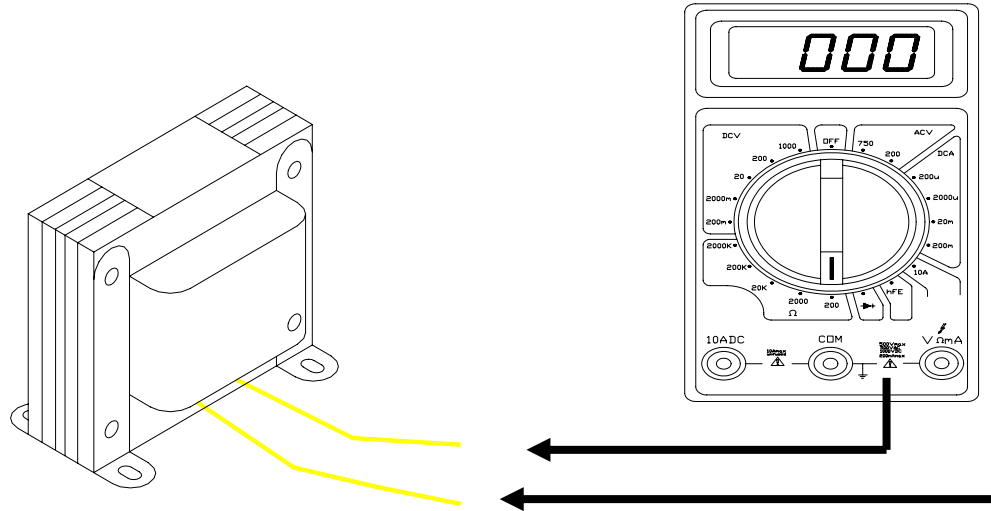


Transformer Wires		Voltage (AC)
Red probe	Black probe	
RED/(BLUE)	RED/(BLUE)	110V (Red)/220V(Blue)
BLACK	BLACK	12-13V
WHITE	WHITE	12-13V
ORANGE	ORANGE	18-20V
YELLOW	YELLOW	10-12V

Inspection Points

1. If the transformer primary (red wires for 110V power supply or blue wires for 220V power supply) have no voltage, there is no incoming voltage to the transformer. Inspect F1 3A fuse on the drive board.
2. If any of the secondary wires have no voltage, the transformer is bad.

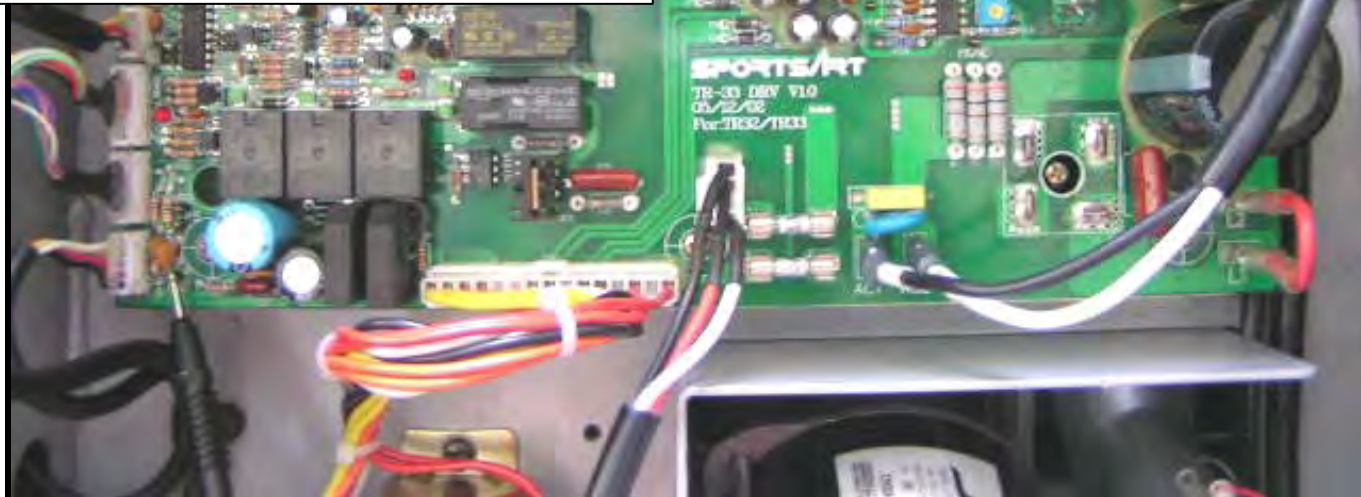
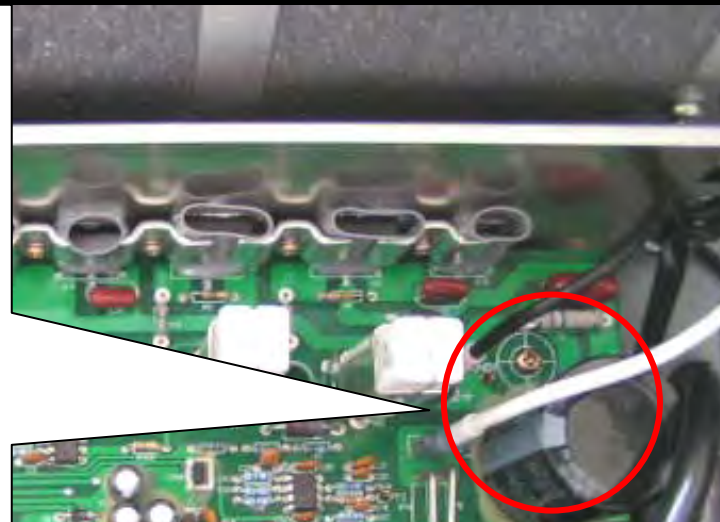
Inductor Test Configuration



Test Procedure

1. Remove the inductor wires from the drive board.
2. Set voltmeter to the ohm setting. Place probes separately on the wire connectors.
3. Normal reading: 10 ohm or less.
4. If there is no reaction, the inductor has an electrical open. Replace it.

Drive Motor Voltage Test at the Drive Board



Test Procedure

1. Set voltmeter to the 200 VDC setting. Place probes separately on the M+, M- terminals.
2. Turn on treadmill. Press SPEED<▲> up. Motor rotates.
Normal reading at the lowest speed: 0.2 KPH (0.1 MPH), 5.5-6.5V (110V) or 9-11V (220V).
Normal reading at highest speed: 20.0 KPH (12.0 MPH), 100-120V (110V) or 210-230V (220V).
3. If the drive board does emit voltage, the motor cannot operate. The problem is in front of the motor.

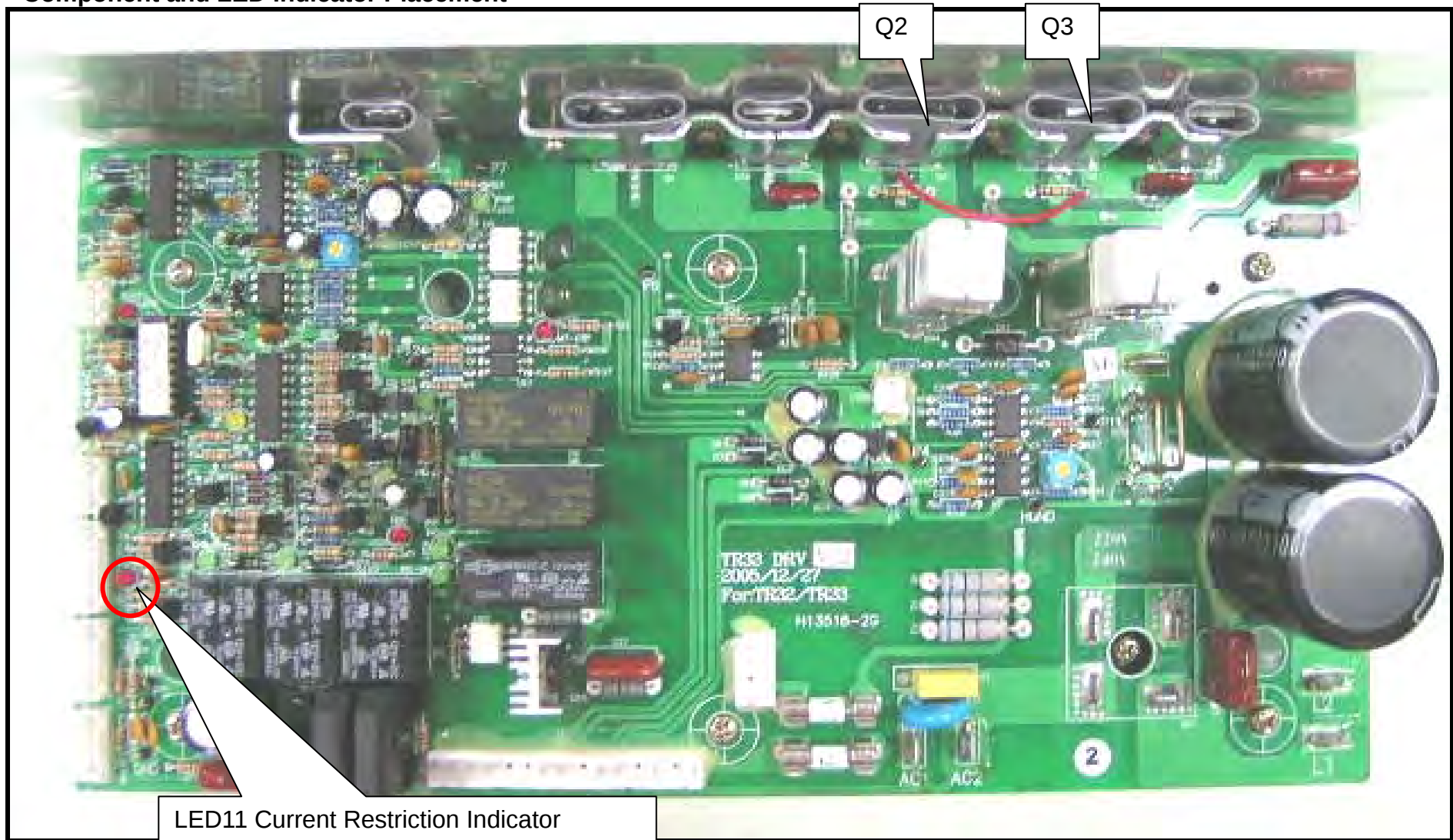
Inspect

If the motor does not operate:

1. If the drive board EMG indicator lights, IGBT has an electrical short. Test the IGBT.
2. Replace the drive board and test.

Drive Board IGBT Test

Component and LED Indicator Placement



Test Procedure

Turn on unit power. Do not press keys.

Inspect whether the drive board LED11 lights.

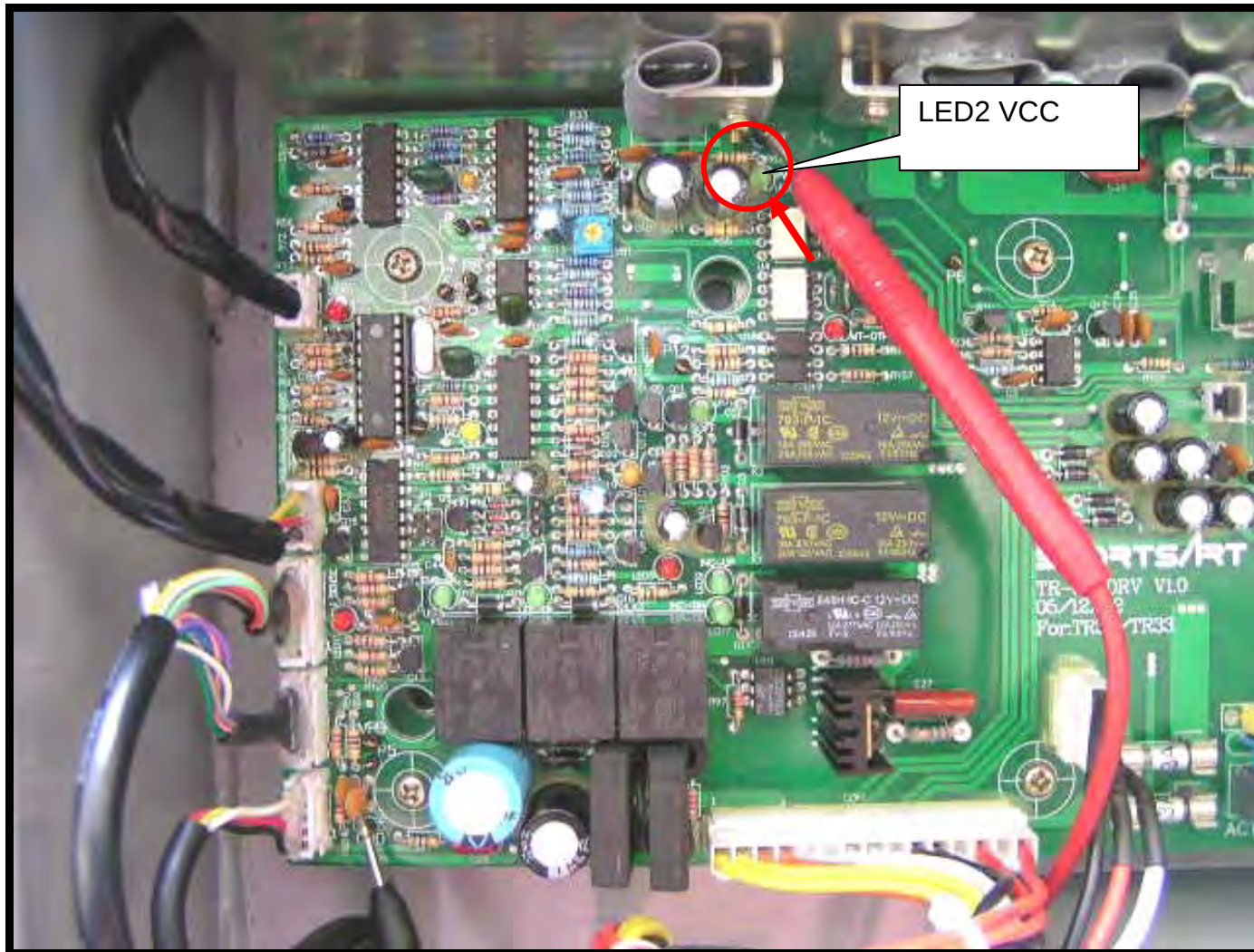
If lit, one or more IGBTs have an electrical short.

Troubleshooting

If LED11 is lit, replace IGBT Q2 and/or IGBT Q3.

Drive Board VCC Power Test

Drive Board VCC Power Indicator Placement



Test Procedure

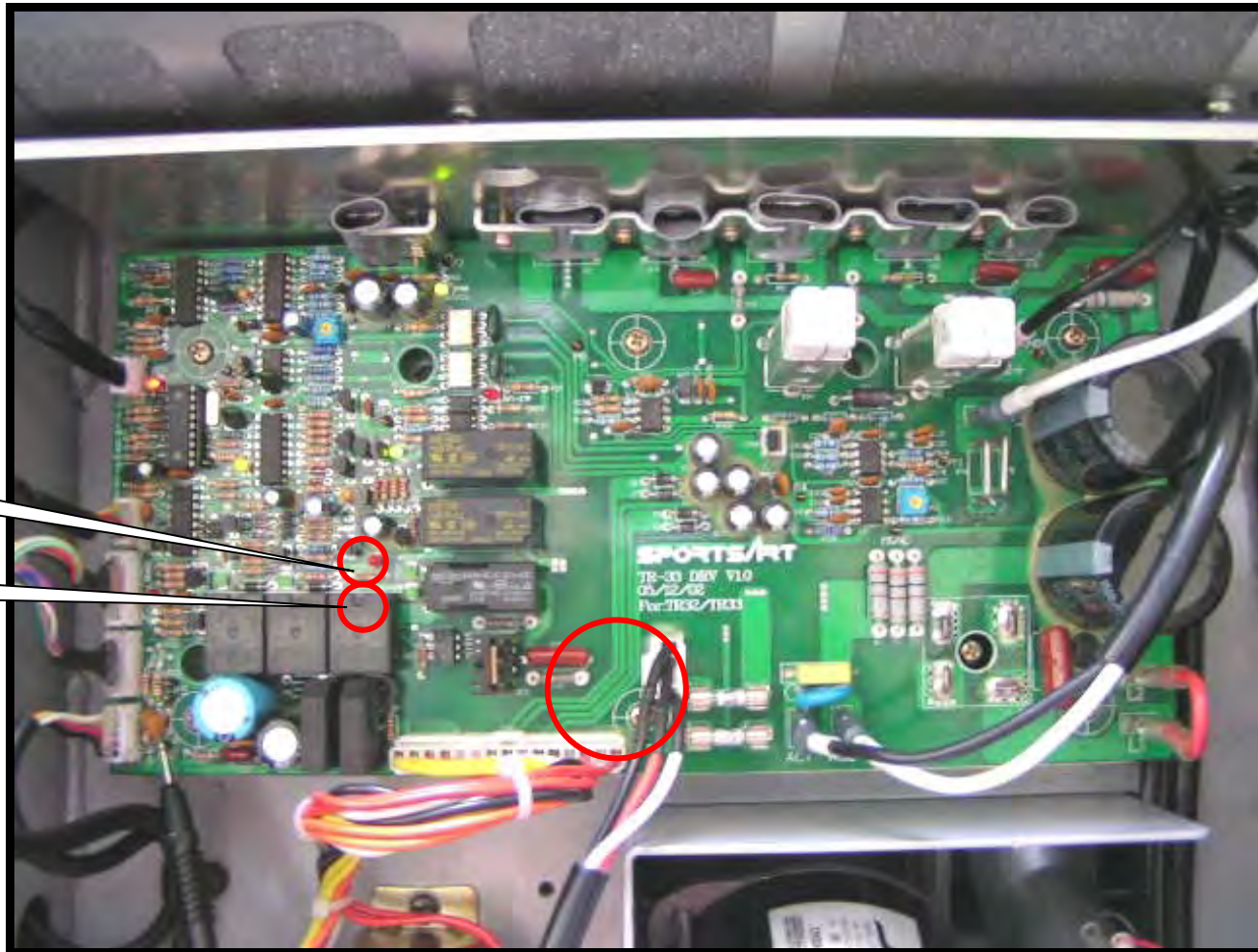
1. Turn on unit power. Power switch lights up.
2. Drive board LED2 lights.

Troubleshooting

If the drive board VCC power indicator does not light:

1. Inspect AC1, AC2 wire connections.
2. Inspect transformer wire connections.
3. Inspect whether fuse F1 2A is broken. Replace if necessary.
4. Inspect CON2, CON3 connections and wires.

Drive Board Incline Motor Power Test



LED9 INC_UP

LED7 INC_DN

Test Procedure

1. Put voltmeter to the 600 VAC setting. Place the red probe on the CON6-WHITE wire pin. To test for up voltage, place the black probe on the CON6-BLACK wire pin. To test down voltage, place the probe on the CON6-RED wire pin.
2. Turn on power. Press QUICK START or another mode of operation.
3. Press INCL<▲>. The drive board INC_UP LED lights. Normal reading: 108~110V (220V: 215~220V). Incline operates upward.
4. Press INCL<▼>. The drive board INC_DN LED lights. Normal reading: 108~110V (220V: 215~220V). Incline operates downward.
5. If there is no voltage, the drive board may be defective.

Inspection Points

Press INCL<▲>. The drive board INC_UP LED lights. CON6 emits AC voltage. If not:

1. Inspect whether LED9 lights.
2. Inspect whether K5 RELAY activates.
3. Inspect the F2 3A fuse on the drive board.
4. Inspect whether Q15 BT137 is burnt.

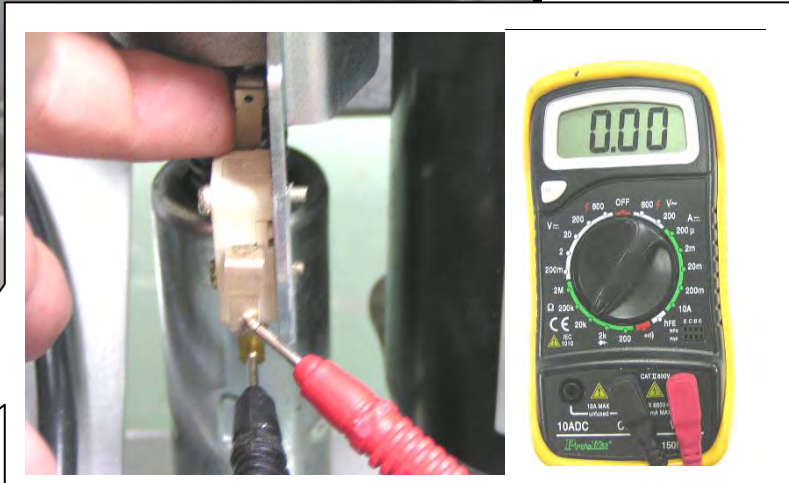
Press INCL<▼>. The drive board INC_DN LED lights. CON6 emits AC voltage. If not:

1. Inspect whether LED7 lights.
2. Inspect whether K5 RELAY activates.
3. Inspect the F2 3A fuse on the drive board.
4. Inspect whether Q15 BT137 is burnt.

Incline Limiter Switch Test



LED8 ZERO Indicator



Test Procedure

Put voltmeter to the 20K Ω setting. Place probes on the calibration switch pins.

Touch the switch to activate it.

Normal reading: 0 Ω .

Turn on power. Touch the switch again. LED8 ZERO lights.

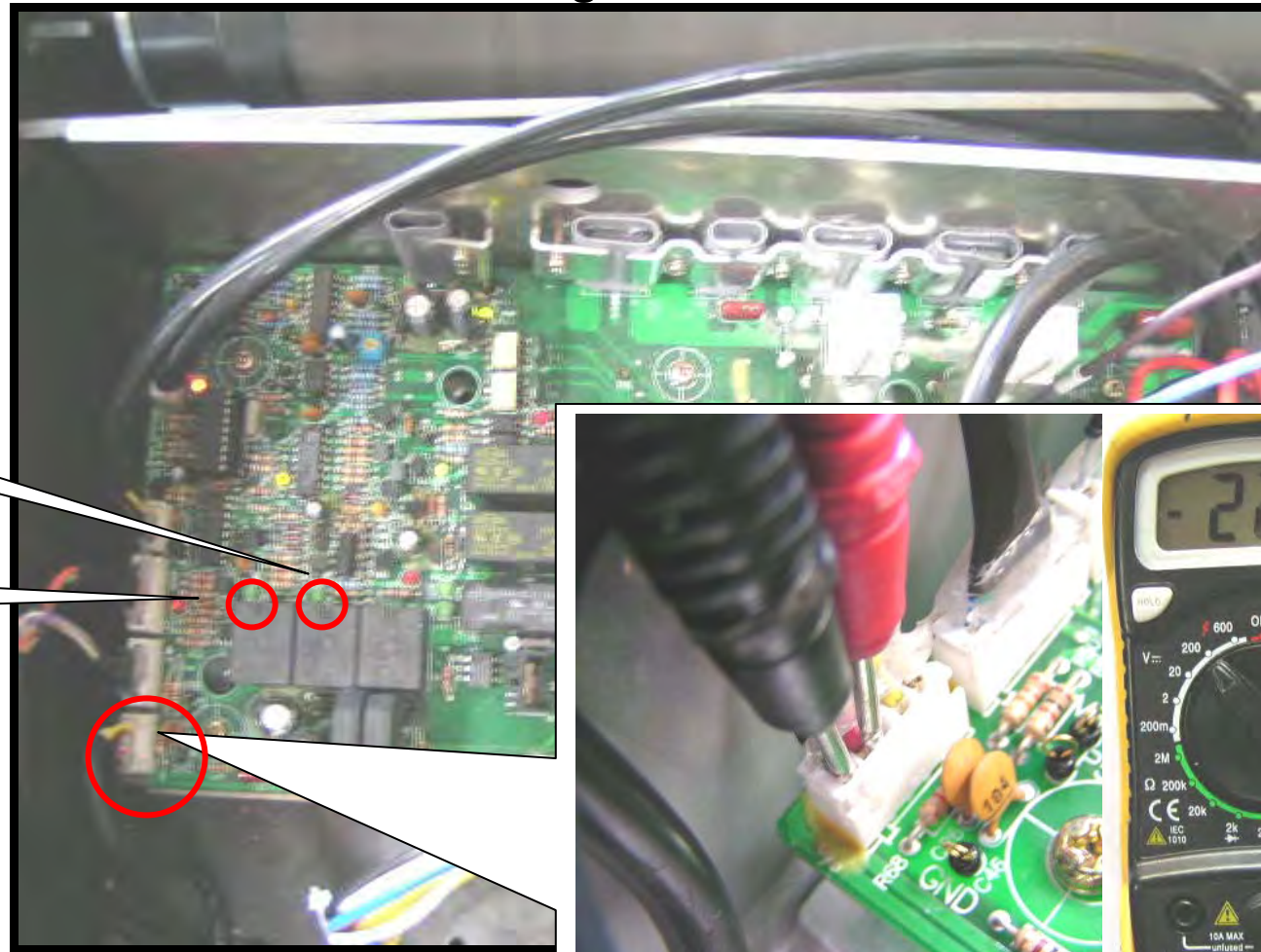
Inspection Points

If not as above, replace the switch and test again.

TR33 Drive Board Cushion Motor Voltage Test

LED4 CUS_UP

LED3 CUS_DN



Test Procedure

1. Put the voltmeter to the 200 VDC setting. Place the red probe on the CON4-RED wire pin. Place the black probe on the CON4-BLACK wire pin.
2. Turn on unit power. Operate the unit.
3. Press the CUSHION <FIRM> key. The drive board LED4 CUS_UP indicator lights. Normal reading: -22 VDC. The cushion adjustment motor operates.
4. Press the CUSHION <SOFT> key. The drive board LED3 CUS_DN indicator lights. Normal reading: 22 VDC. The cushion adjustment motor operates.
5. If there is no voltage, the drive board is defective.

Inspection Points

Press the CUSHION <FIRM> key. The drive board CUS_UP indicator lights. CON4 emits DC voltage. If not, inspect:

1. whether LED4 lights
2. whether the K6 RELAY activates
3. whether BD2 KBU1006 is burnt
4. replace U11 ULN2003 and test operation

Press the CUSHION <SOFT> key. The drive board CUS_DN indicator lights. CON4 emits DC voltage. If not, inspect:

1. whether LED3 lights
2. whether the K4 RELAY activates
3. whether BD2 KBU1006 is burnt
4. replace U11 ULN2003 and test operation

TR33 Cushion Motor Limit Switch Test

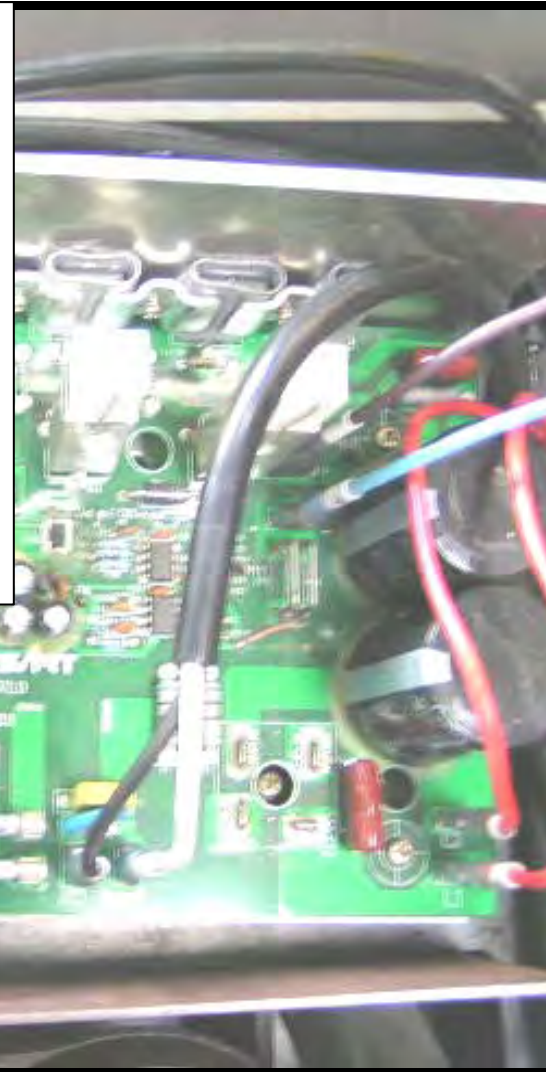


Figure 1

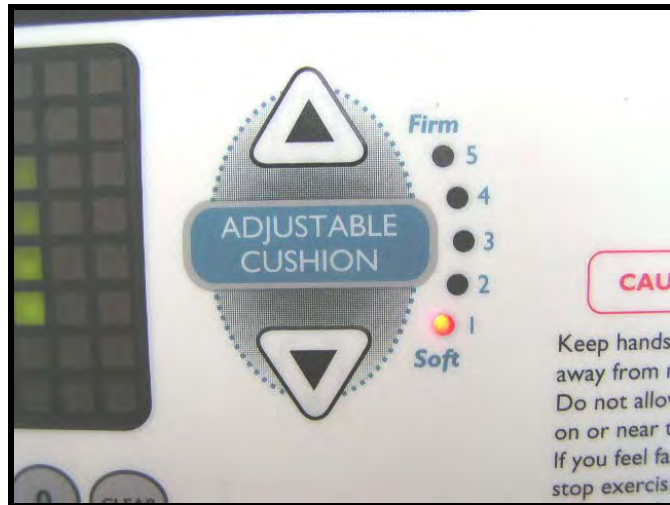


Figure 2



Test Procedure

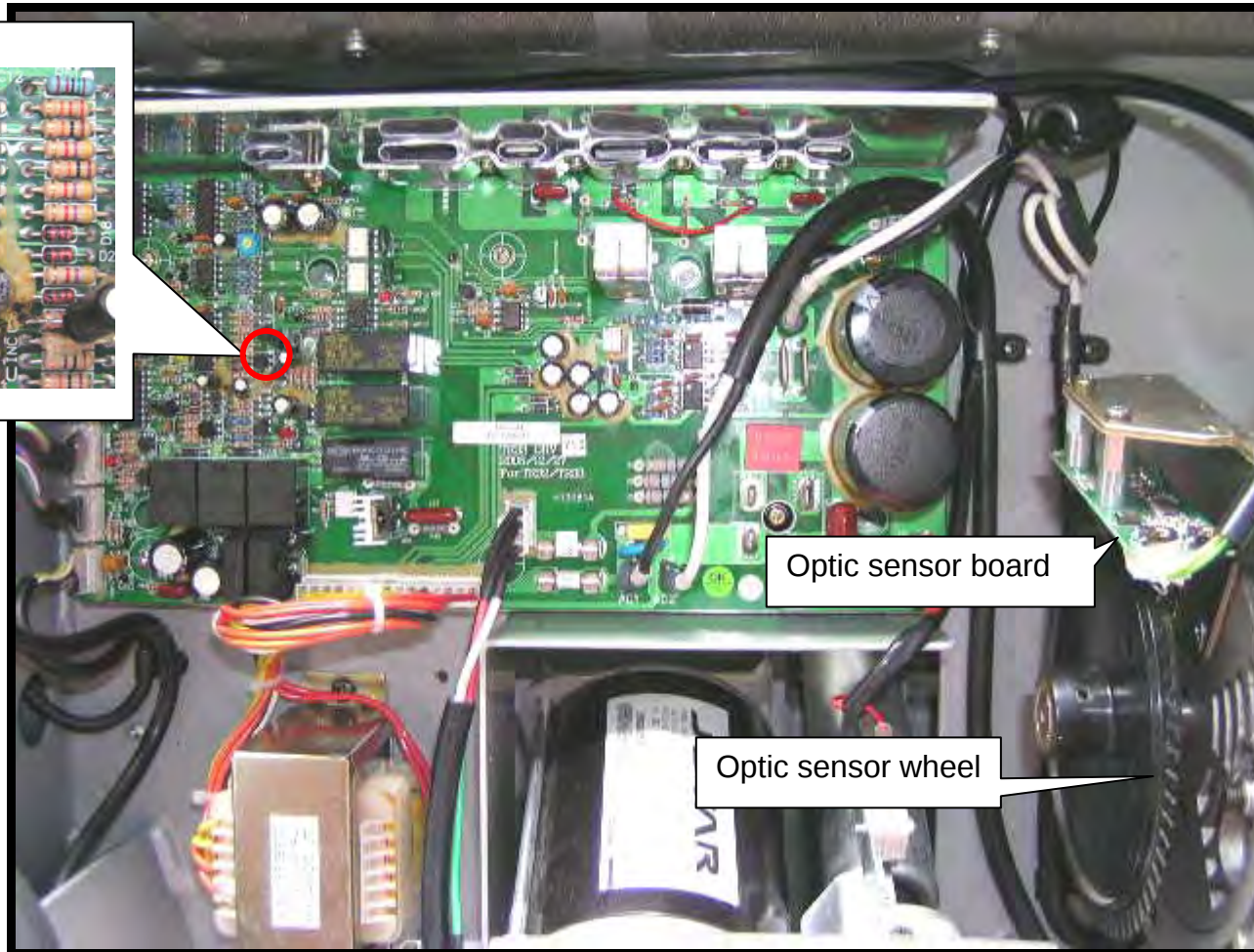
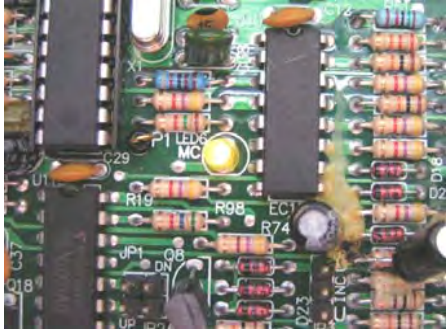
1. Put the voltmeter to the 200 Ω setting. Place the red probe on CON4-RED wire. Place the black probe on the CON4-BLACK wire.
2. Press the CUSHION key to the 1 or 5 setting. Normal reading: (OL) open line.
3. Press the CUSHION key from 2~4. Normal reading: 0~10 Ω .

Points for Inspection

1. If not as above, replace the CUSHION motor.

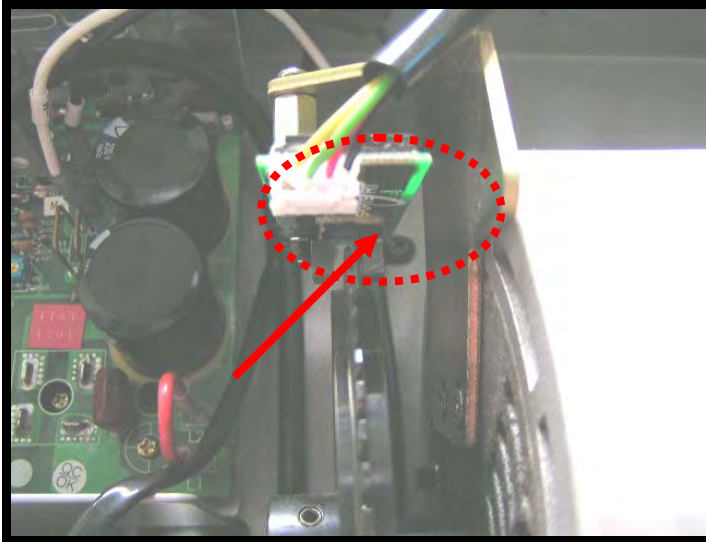
Optic Sensor Signal Test

LED6 MC Indicator



Test Procedure

1. Make sure that the optic wheel spins in the middle of the optic sensor nibs and that there are no broken or bent teeth.
2. Inspect whether the optic sensor wire is connected properly.
3. Turn on power. Do not press any keys. Turn the motor slowly with your hand. The drive board MC indicator lights.
4. If the MC indicator does not flash, the optic sensor is bad. Replace it.

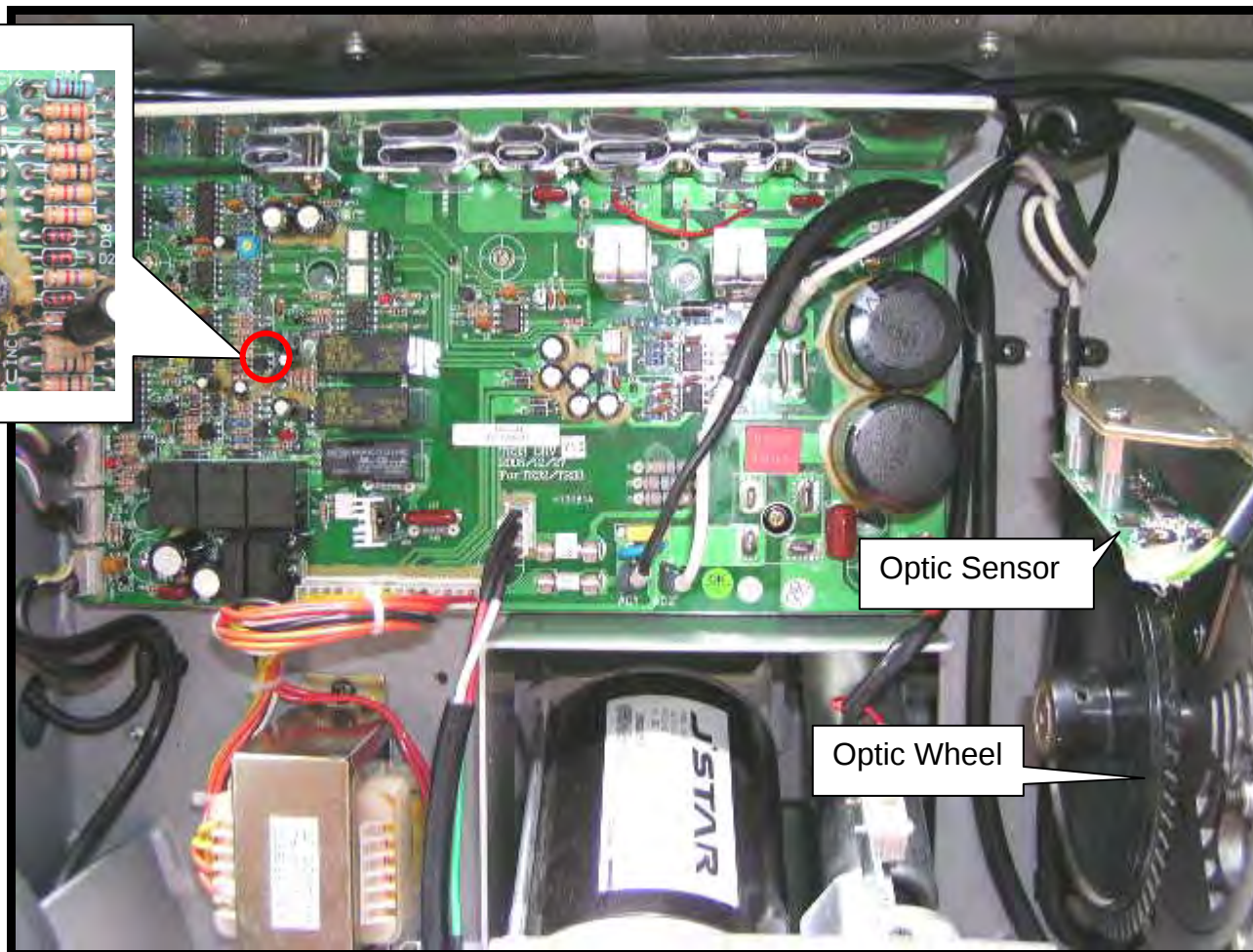
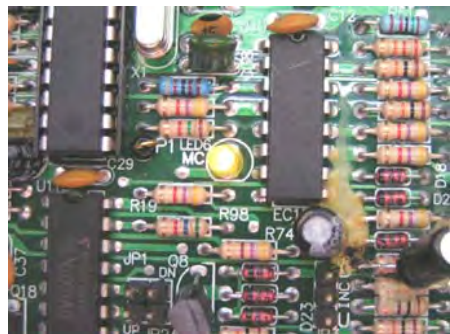


Inspection Points

If when the motor spins, the MC indicator on the drive board does not light, inspect:

1. whether the optic wheel spins in the middle of the optic sensor nibs.
2. whether the optic wheel has missing, broken, or bent teeth.
- the optic sensor wire connections.
3. replace the optic sensor and test unit operation.

Optic Sensor Signal Test - LED



Test Procedure

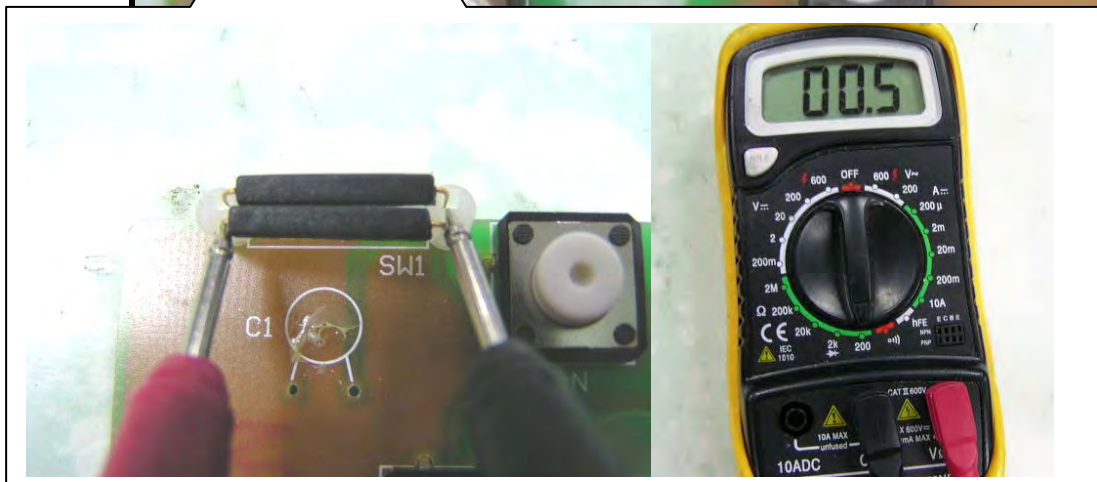
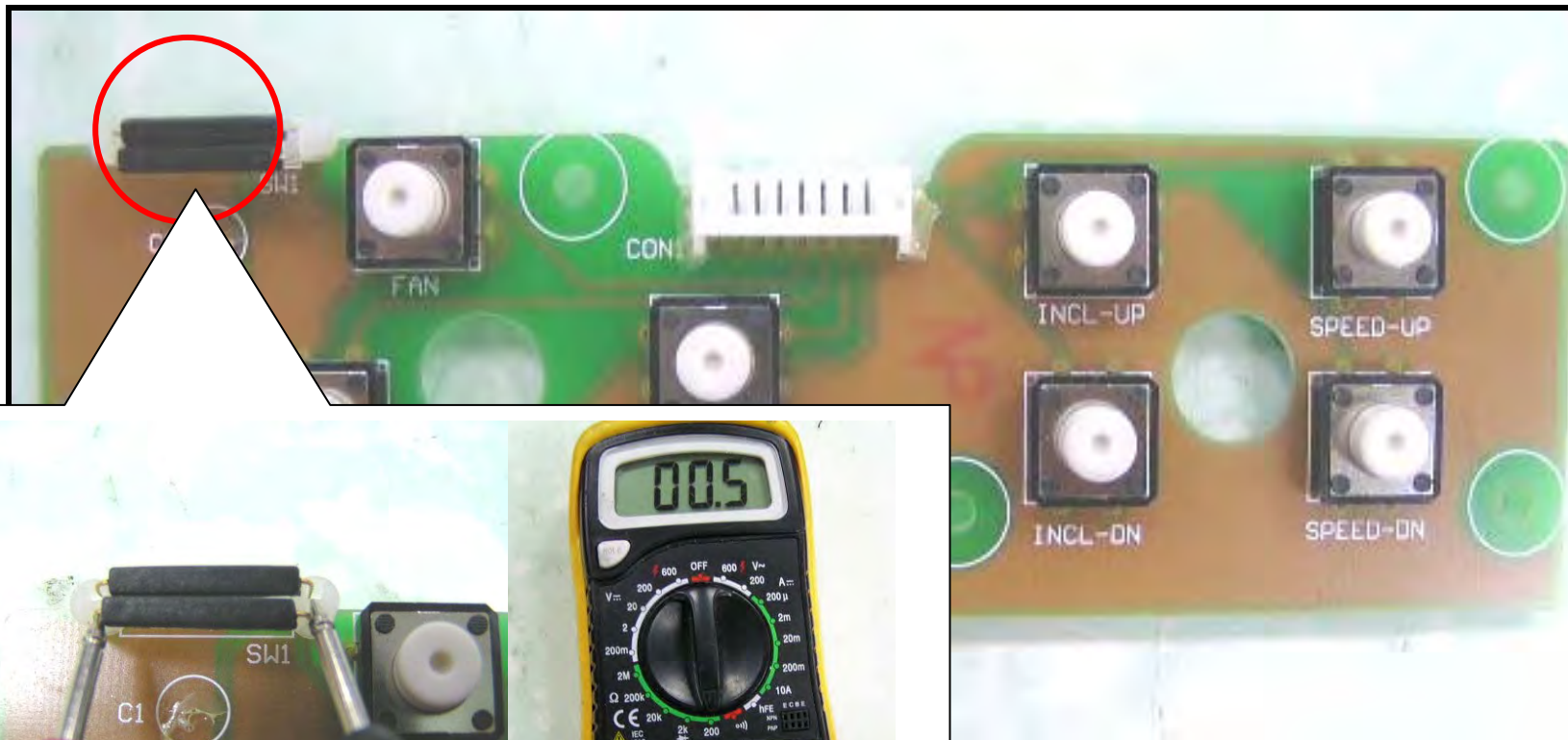
1. Inspect whether the optic sensor wires are connected properly.
2. Turn on unit power. Do not press any keys. Rotate the motor slowly.
3. When the optic wheel moves, LED6 MC on the drive board flashes.
4. If the drive board MC LED does not flash, the optic sensor signal is malfunctioning.

Inspection Points

If the MC indicator on the drive board does not flash when the motor moves, inspect:

1. wire connections from the optic sensor to the drive board.
2. replace the optic sensor as a test.

Safety Key Test



Test Procedure

1. Put voltmeter to the 200 Ω setting.
2. Place probes on wires on both sides of the reed switch shown in Fig. 1.
Normal reading with the magnet not in place: OL (Open Line).
3. Place probes and magnet as shown in Fig. 2. Normal reading: 0 Ω .

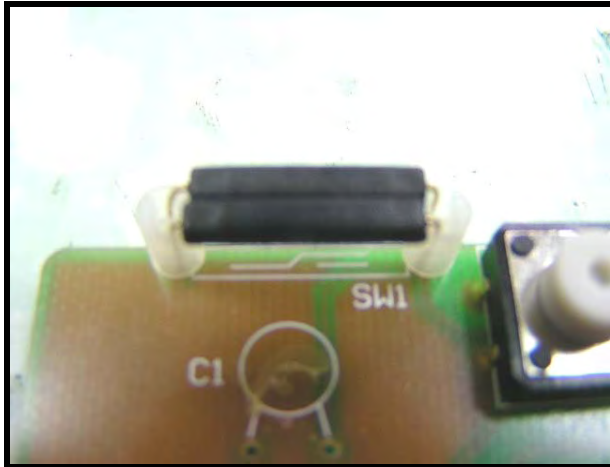


Fig. 1 – safety key not in place

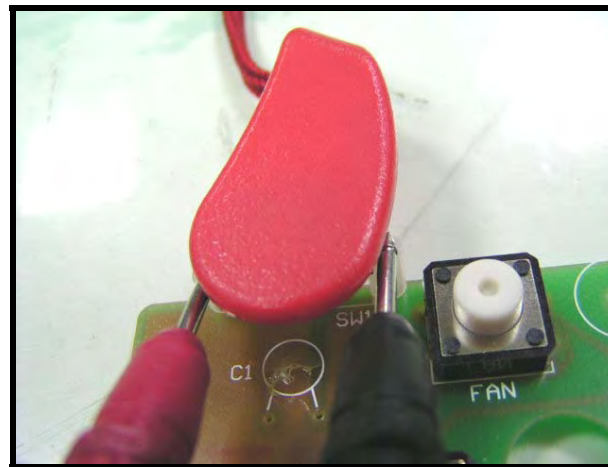


Fig. 2 – safety key in place

Inspection Points

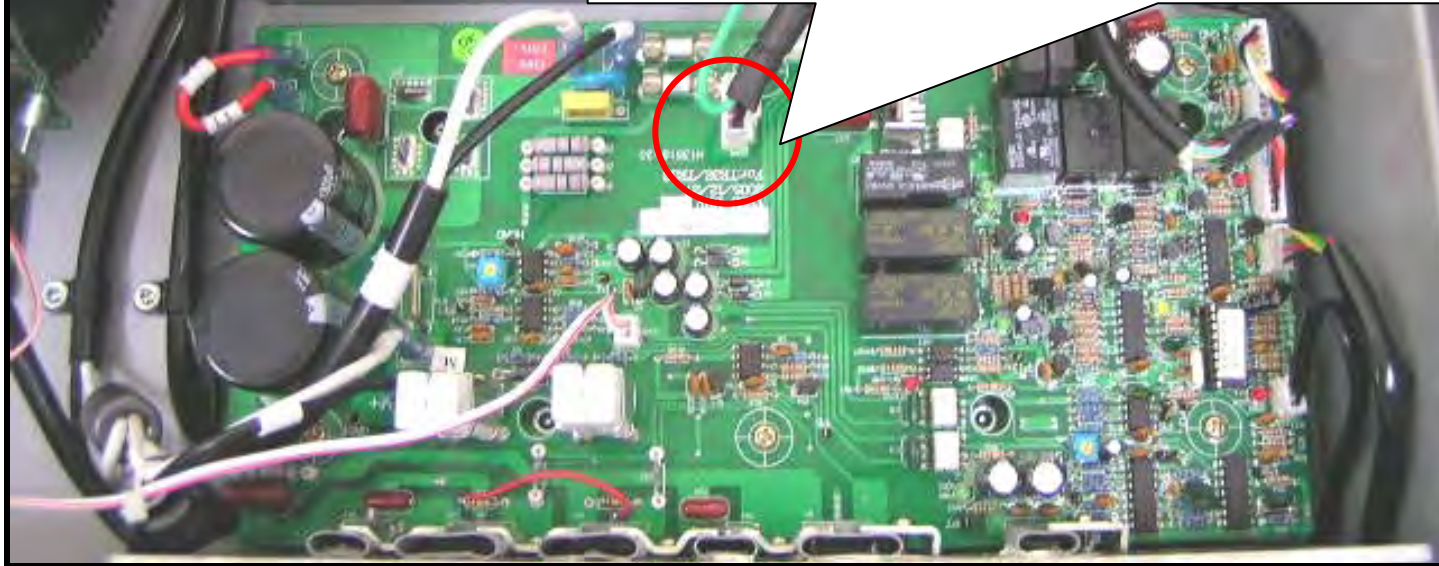
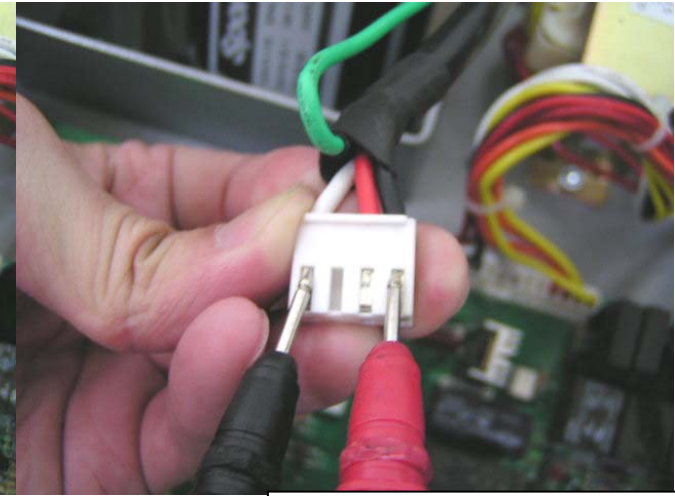
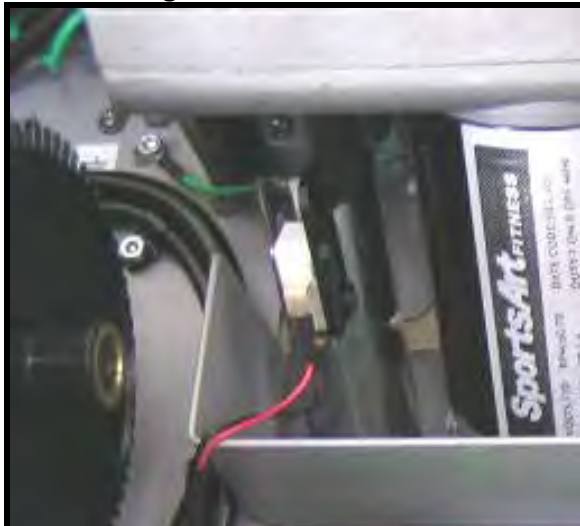
If not as above, the reed switch is malfunctioning. Replace the reed switch.

AC Incline Motor Resistance Test

Fig. 1

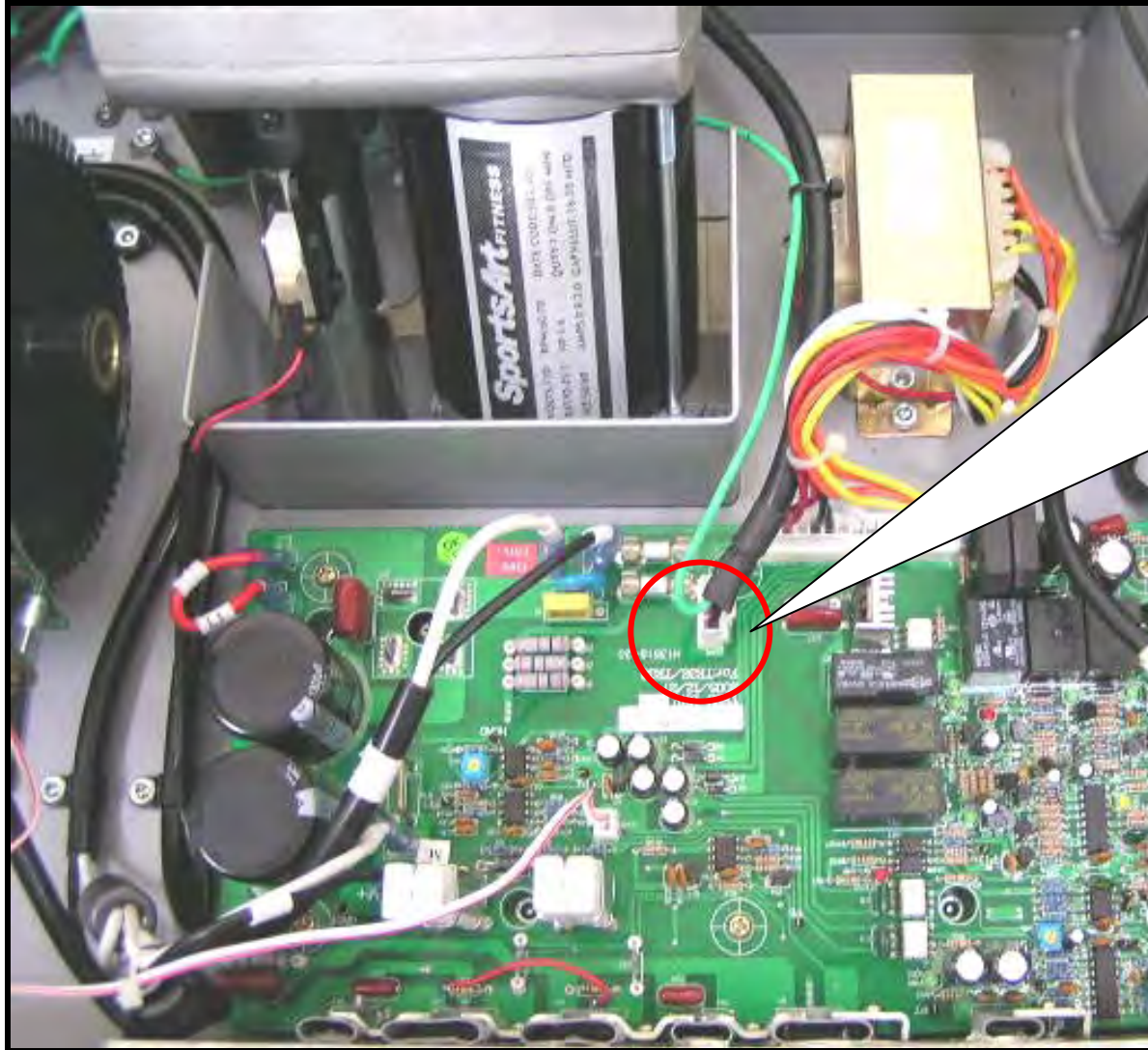
Test Position 1

Test Position 2



Test Configuration

Fig. 2



Test Position



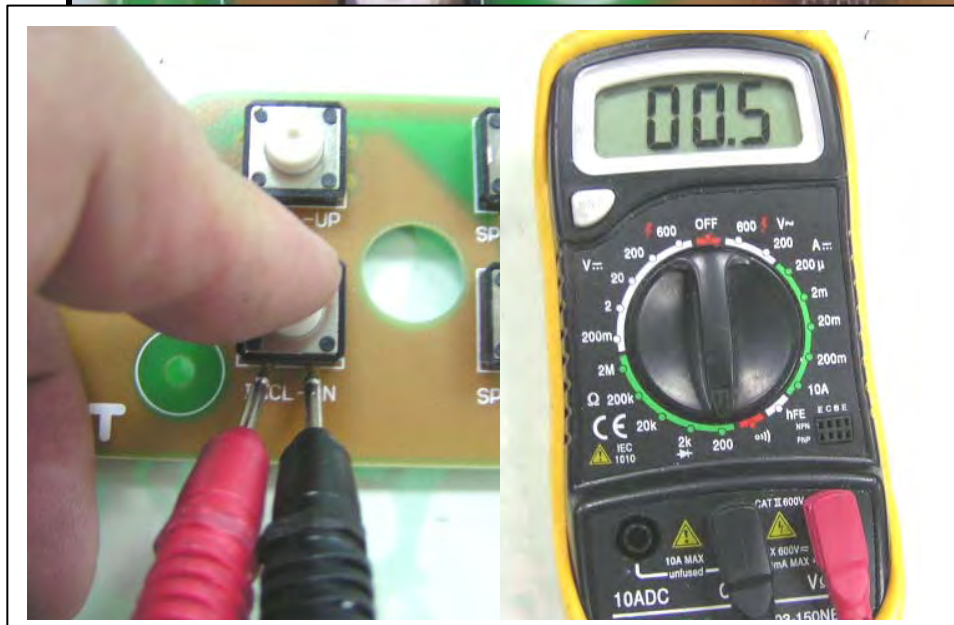
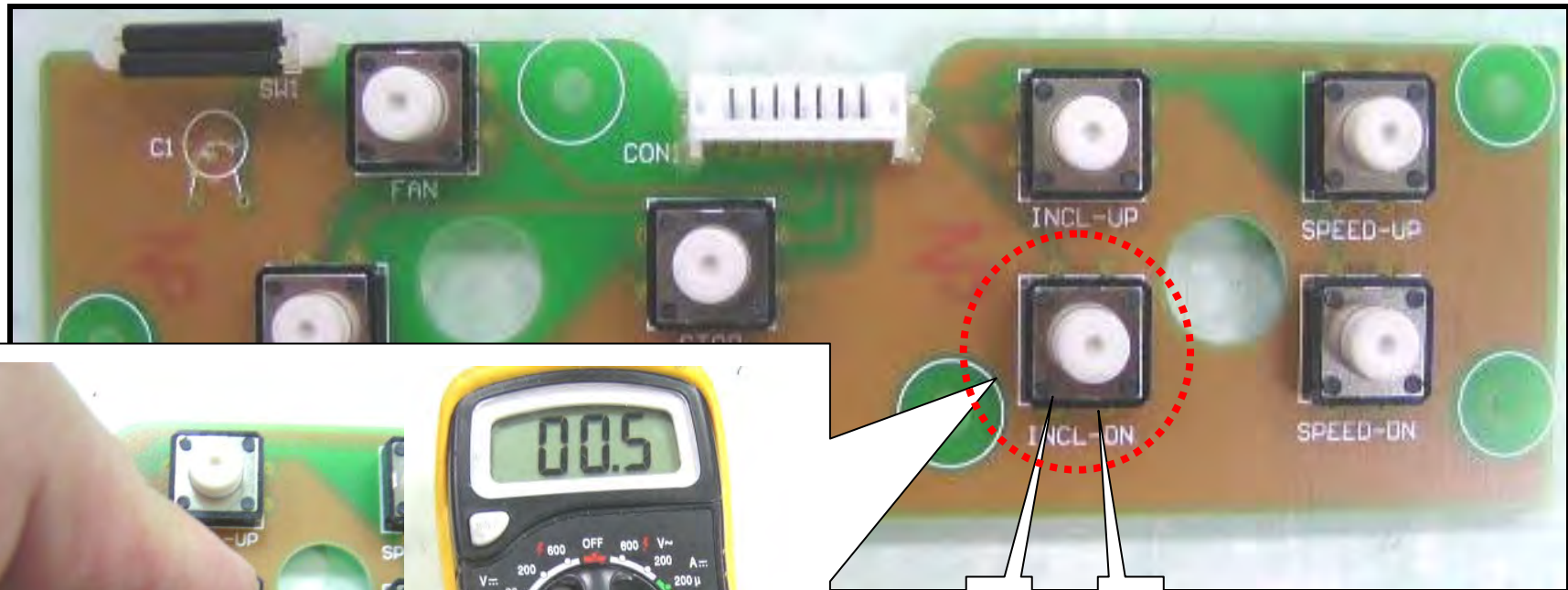
Test Procedure

1. Remove the AC incline motor wire connection from the drive board.
2. Put voltmeter to the 200 ohm setting. Place probes separately on the red and white wires of the AC wires as shown in Fig. 1. Normal reading: 22.5 ohm or less. (Readings on black and white are the same.)
3. Place probes separately on red and black wires as shown in Fig. 2. Normal reading: 43.5 ohm or less.
4. If there is no reading, the incline motor is bad.

Circumstance of Malfunction

1. Press INCLINE<▲> or INCLINE<▼> key. Incline fails to operate. After about 35 seconds, ERR7 appears.

Keypad Test



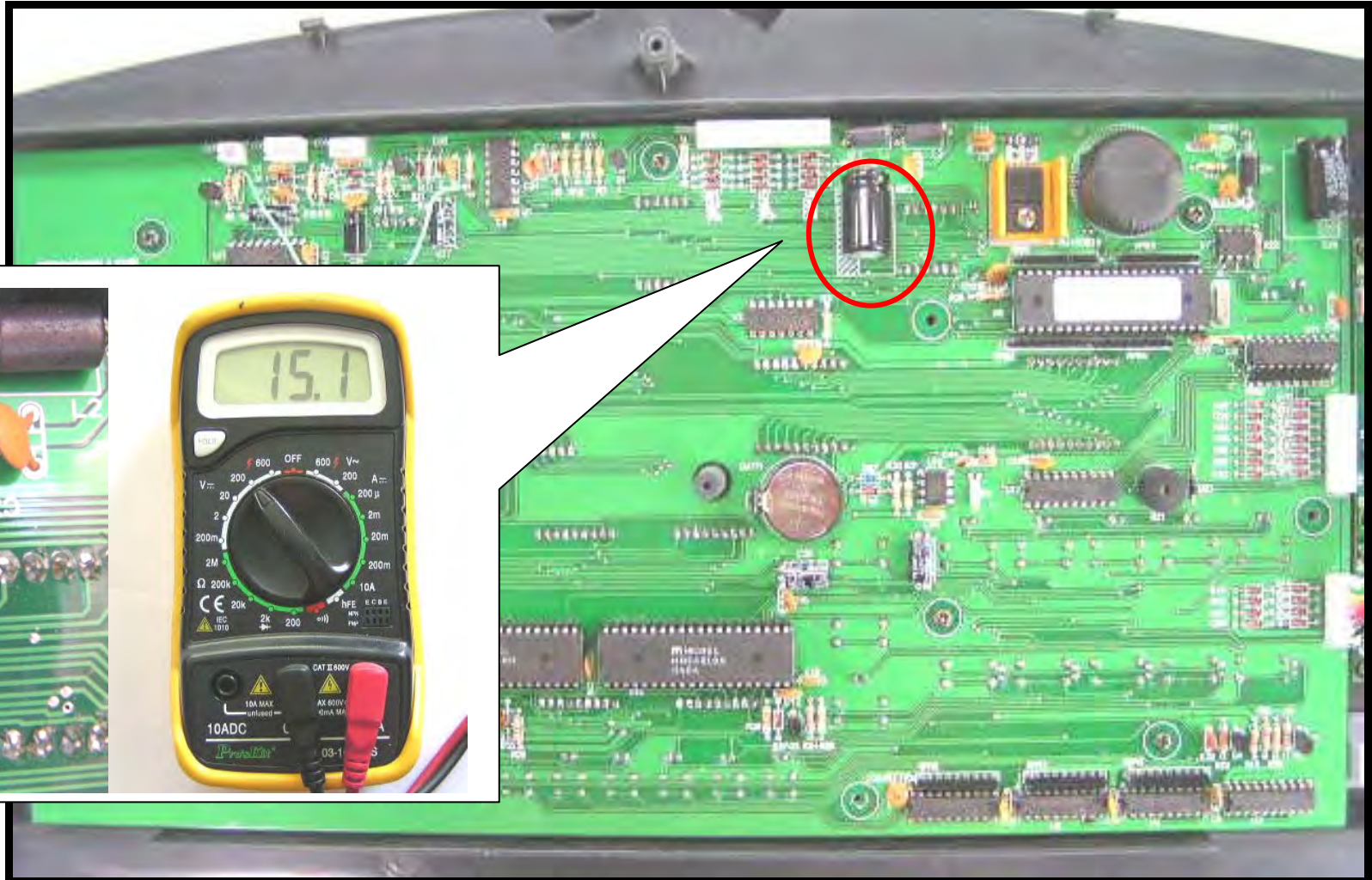
Test Procedure

1. Put the voltmeter to the 200 ohm setting. Place probes separately on key switch points A and B.
2. Do not press any keys. Voltmeter shows no reaction: OL (open line).
3. Press a key. Voltmeter shows 0 ohm.

Circumstance of Malfunction

1. If the key is not pressed and the voltmeter shows 0 ohm, the key switch has a permanent electrical short. Replace it.
2. If the key is pressed and the voltmeter shows no reaction, the key switch circuit has a permanent electrical open. Replace it.

Display Board VBB Circuit Test



Test Procedure

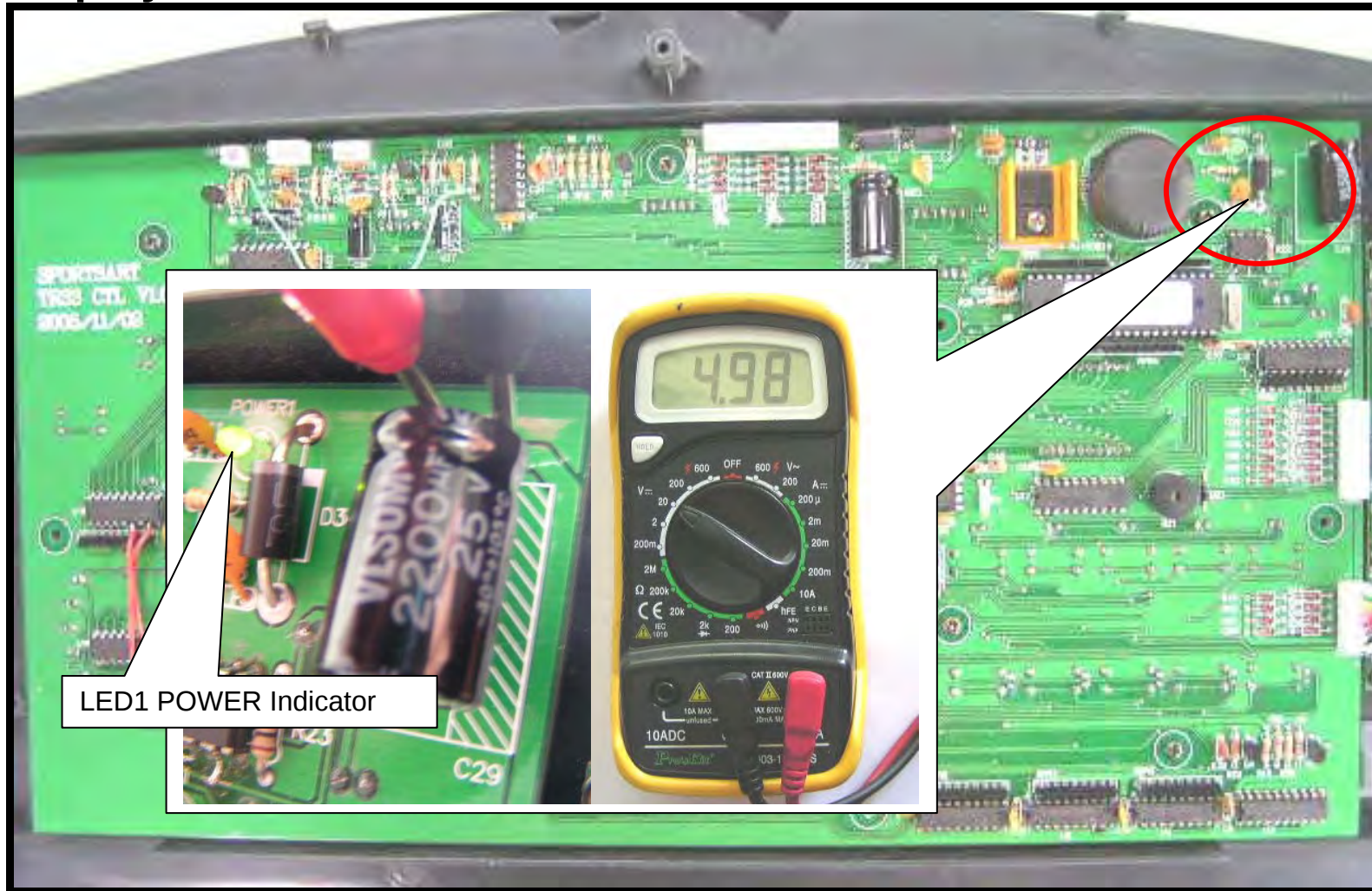
1. Turn on power. Drive board LED2 lights.
2. Put multi-meter to the DC 20 VDC setting. Place probes as shown.
3. Normal reading: about 15~16 VDC.

Inspection Points

If there is not 15~16 VDC, inspect:

1. Data cable wire connections from the drive board to the display board.
2. Whether the data cable is pinched or broken.
3. Replace drive board component BD3 KBU1006 and test operation.

Display Board VCC Circuit Test



Test Procedure

1. Turn on power. Drive board LED2 lights.
2. Put voltmeter to the DC 20 VDC setting. Place probes as shown.
3. Display board LED1 lights. Normal reading: 4.9~5 VDC.
4. Display beeps once and lights up.

Inspection Points

If after turning unit power, the LED1 POWER indicator on the display and other display windows do not light, inspect:

1. whether there is VCC voltage
2. replace D14 UF5406G or U5 SK8051S and test operation.

Telemetry Heart Rate Test



Telemetry Receiver Board (under display)



Heart rate telemetry transmitter

Static Test

1. Wear the telemetry strap in properly.
2. Turn on unit power. Stand on walk belt about 80 cm from the display.
3. After five seconds, the display shows heart rate value.

Active Test

1. Wear the telemetry strap in properly.
2. Press SPEED<▲> or <▼> key to set the SPEED setting.
3. After the walk belt starts to rotate, run on the walk belt about 80 cm from the display.
4. After five seconds, the display shows heart rate value.

Inspection Points

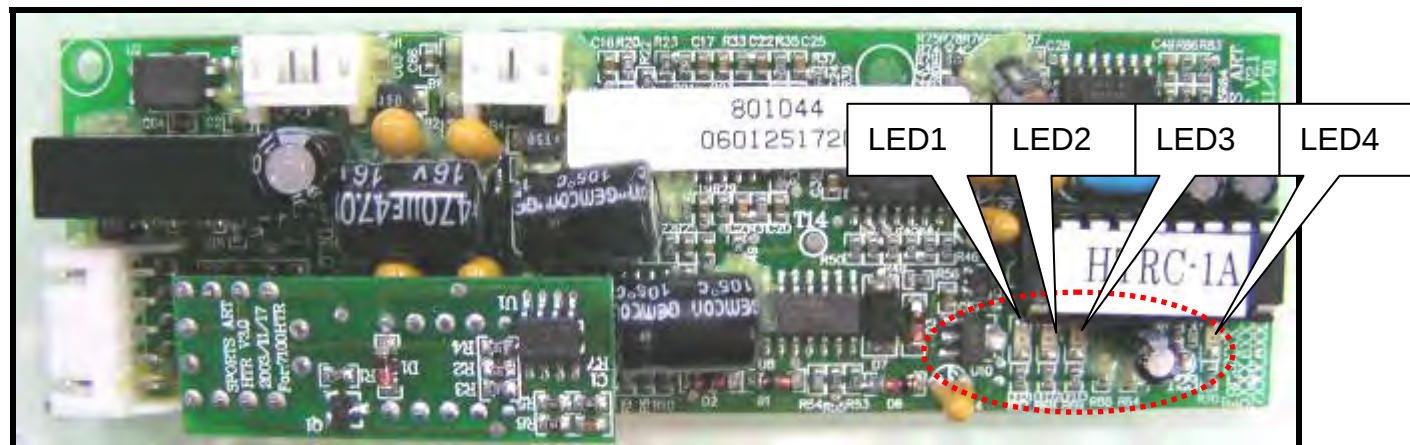
If the static test failed, inspect:

1. Wires from the display to the telemetry receiver board.
2. Replace the telemetry strap and test again.

If the static test passed but the active test failed, inspect:

1. The telemetry strap. Batteries may be low. The strap might not be fastened securely.
2. Replace the telemetry strap and test again.

HTR Board LED Indicators



Indicator	Color	Indicates	Explanation
LED1	Red	Telemetry heart rate signal	Flashes to indicate incoming telemetry signal
LED2	Green	HTR handlebar signal	Lights to indicate hands on HTR grips
LED3	Orange	HTR heart rate	Flashes to indicate incoming HTR signal
LED4	Red	Outgoing heart rate signal	Each flash indicates an outgoing heart rate signal

Test Procedure

1. Do not hold HTR grips. No LEDs on the HTR board light.
2. Hold the HTR grips with both hands. HTR board LED2 lights.
3. When the HTR signal enters the board, LED3 flashes.
4. When the HTR board emits the HTR signal to the display, LED4 flashes.
5. Within ten seconds, the heart rate window displays a heart rate value.

Inspection Points

If not as above, refer to the chart below.

Order	Malfunction	Cause	Troubleshooting
1	LED1 does not light	No telemetry signal is entering the board.	Telemetry transmitter, wires
2	LED2 does not light	No one is holding HTR grips.	HTR grips, wires from grips to HTR board.
3	LED3 does not light	No HTR is entering the board.	HTR grips, wires from grips to HTR board.
4	LED4 does not light	The HTR board is not emitting an HTR signal.	HTR board
5	No heart rate on display	HTR board is not sending a signal to the display.	3-pin cable, display

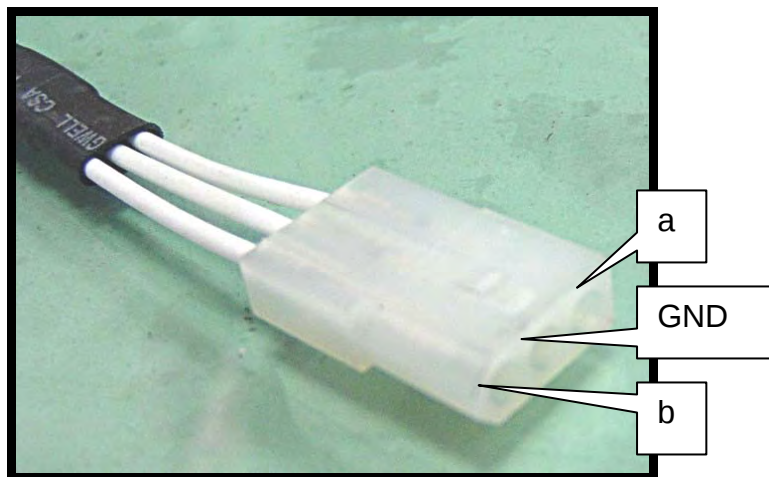
HTR System Continuity Test (3-pin cable to HTR handlebars)

1. Do not turn on unit power. Disconnect the 3-pin wire connectors from the HTR board.
2. Put voltmeter to the 200 ohm setting. Place probes as shown.
3. Test configuration

Signal Line Continuity Test	
Test Points	Normal Reading
A-a	Continuity
A-b	Open

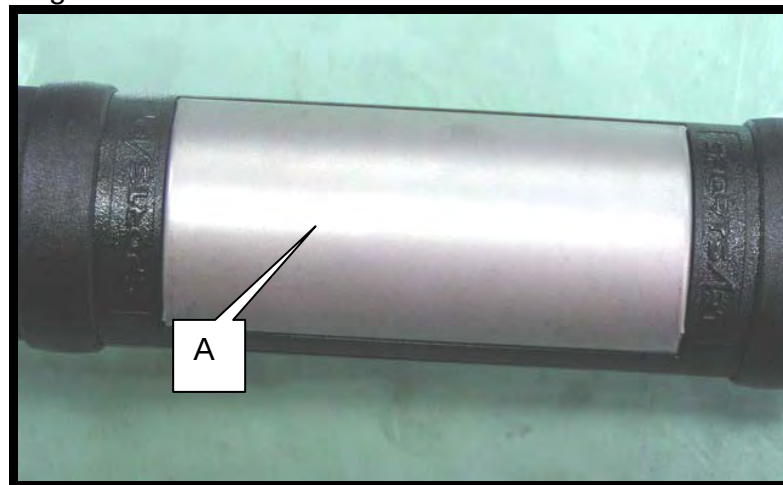
Ground Line Continuity Test	
Test Points	Normal Reading
A-GND	Open
Frame to GND	Open

Fig. 1



(HTR board 3-pin cable)

Fig. 2



Test Procedure

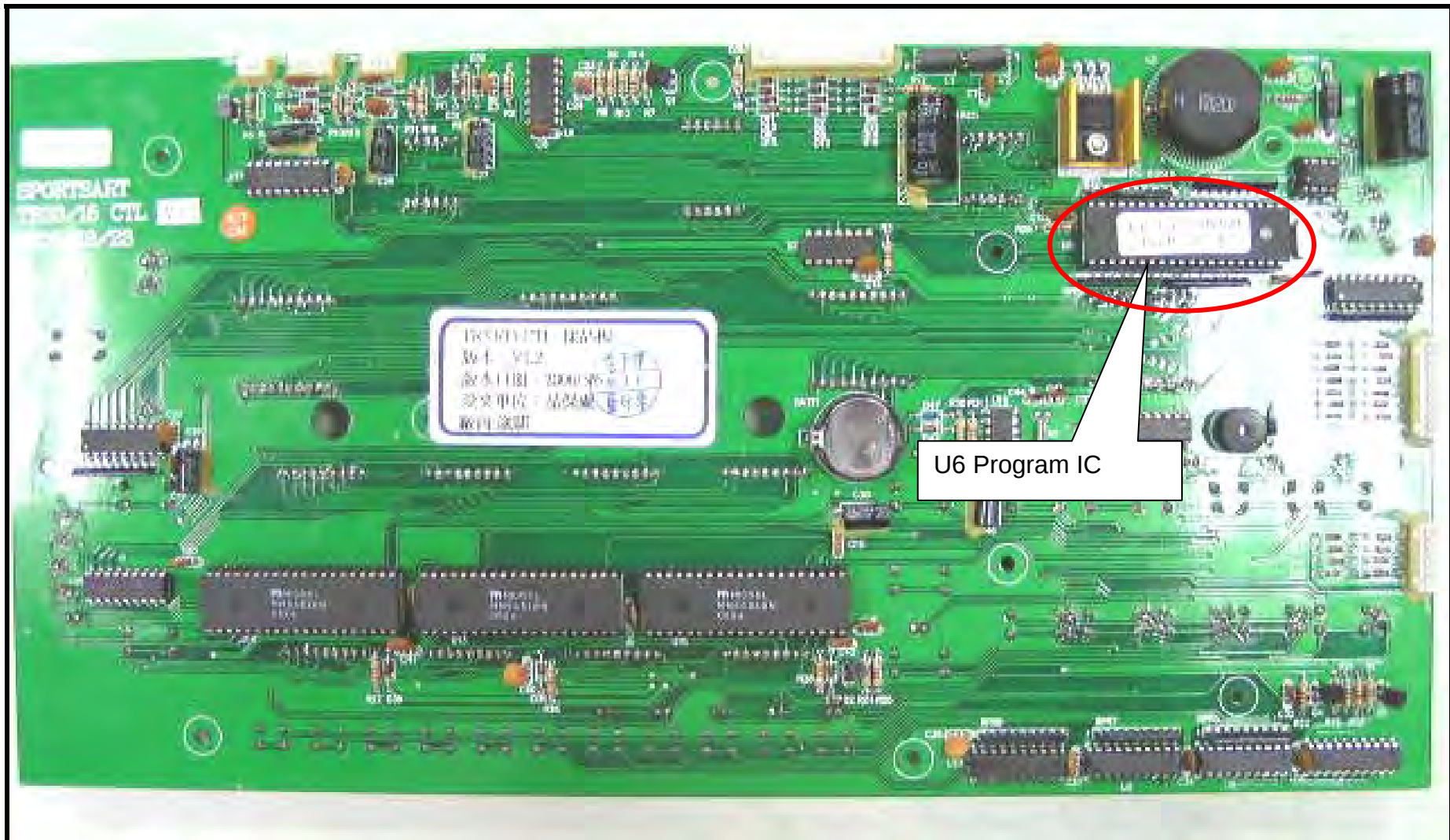
1. Do not hold HTR grips. No LEDs on the HTR board light.
2. Hold the HTR grips with both hands. HTR board LED2 lights.
3. When the HTR signal enters the board, LED3 flashes.
4. When the HTR board emits the HTR signal to the display, LED4 flashes.
5. Within ten seconds, the heart rate window displays a heart rate value.

Inspection Points

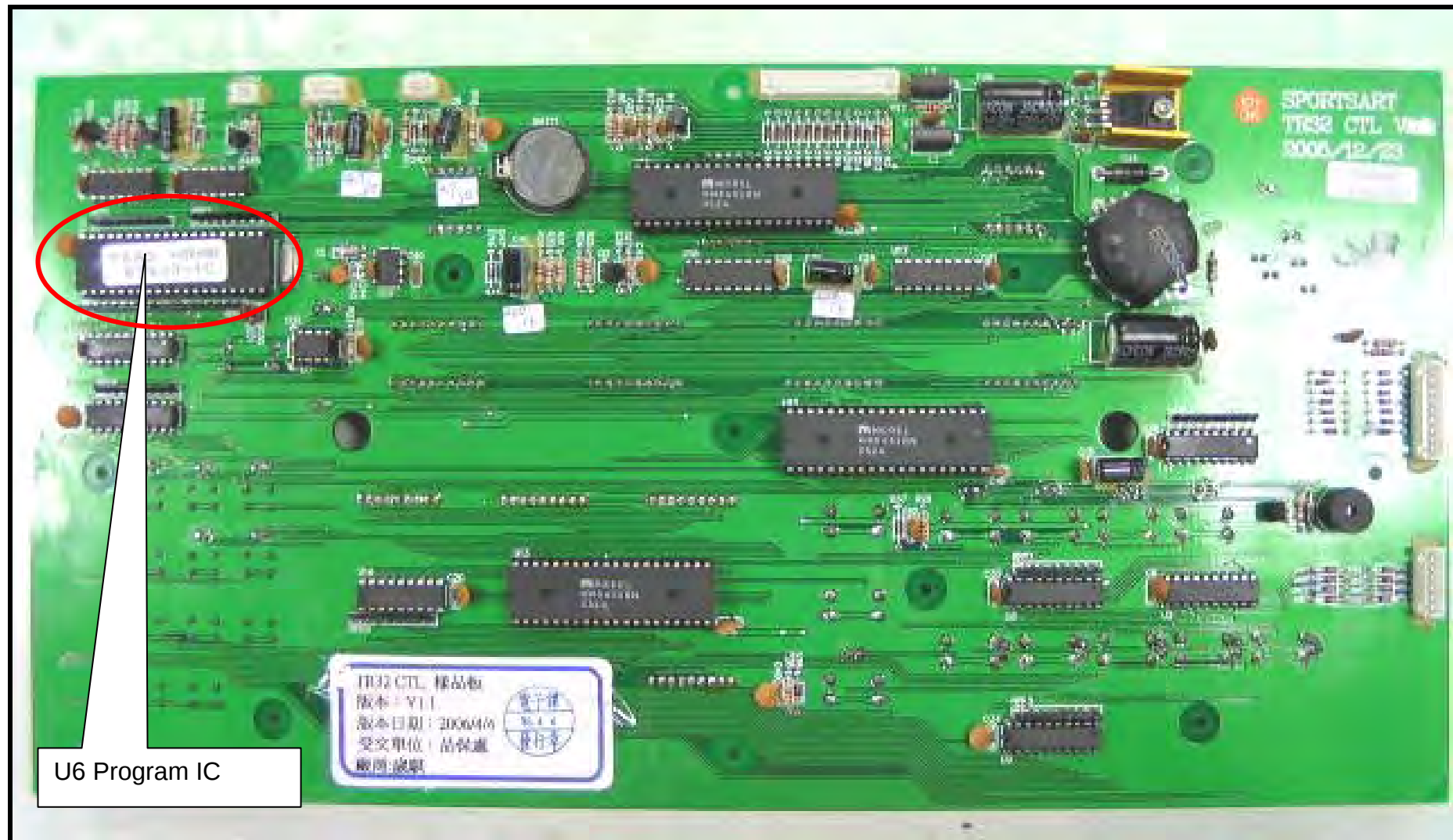
1. If not as above, refer to the chart below.

Order	Malfunction	Cause	Troubleshooting
1	LED1 does not light	No telemetry signal is entering the board.	Telemetry transmitter, wires
2	LED2 does not light	No one is holding HTR grips.	HTR grips, wires from grips to HTR board.
3	LED3 does not light	No HTR is entering the board.	HTR grips, wires from grips to HTR board.
4	LED4 does not light	The HTR board is not emitting an HTR signal.	HTR board
5	No heart rate on display	HTR board is not sending a signal to the display.	3-pin cable, display

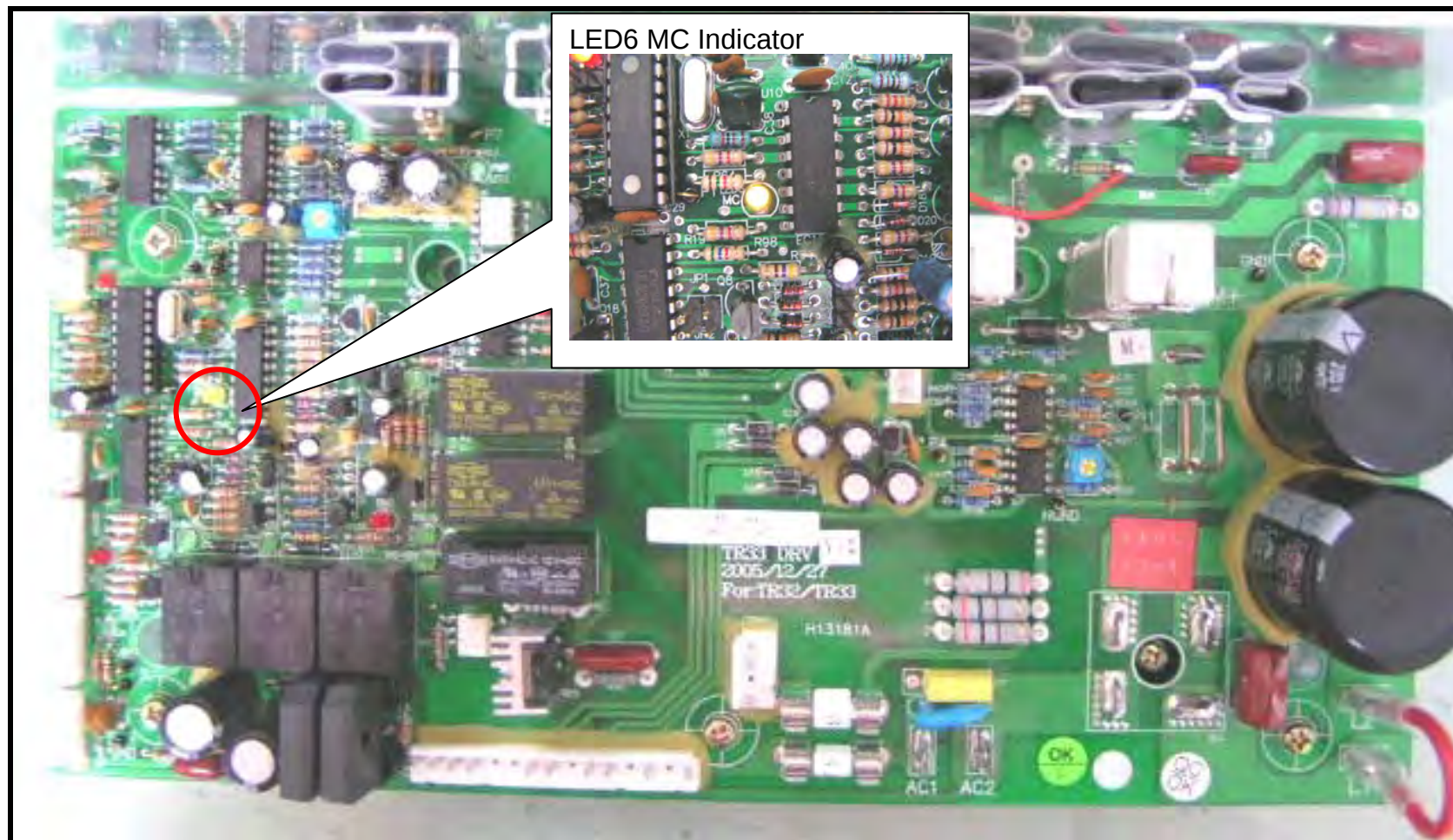
TR33 Display Board U6 IC



TR31 and TR32 Display Board U6 IC



Drive Board LED6 MC Indicator



TR31/TR32/Tr33 Treadmill Repair Manual

Chapter 8

8-0-0 Incline and Cushion Calibration

8-1-1 TR31/TR32/TR33 AC Incline System Calibration – Software (Continued to 8-1-2)

8-2-1 AC Incline System Calibration – Hardware (Continued to 8-2-4)

8-3-1 TR33 AC Cushion System Calibration – Software (Continued to 8-3-2)

8-4-1 AC Cushion System Calibration – Hardware (Continued to 8-4-4)

TR31/TR32/TR33 AC Incline System Calibration – Software



Incline System Software Calibration

Calibration Through Operation

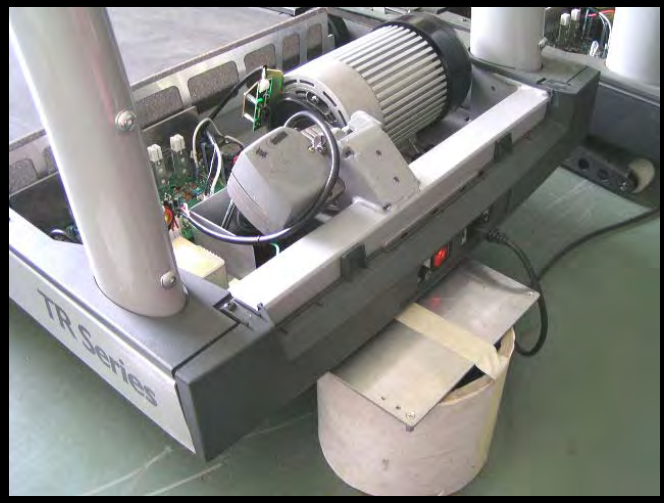
1. Press INCL<▲> key until the incline window shows 15%. When the incline operates up, LED9 on the drive board lights. When the incline stops moving, LED8 extinguishes.
2. Press INCL<▼> key until the incline window shows 0%. When the incline operates down, LED7 on the drive board lights. When the incline stops moving, LED8 extinguishes.
3. When the drive board LED8 ZERO indicator lights, incline calibration has been completed.

Calibration Through Restarting

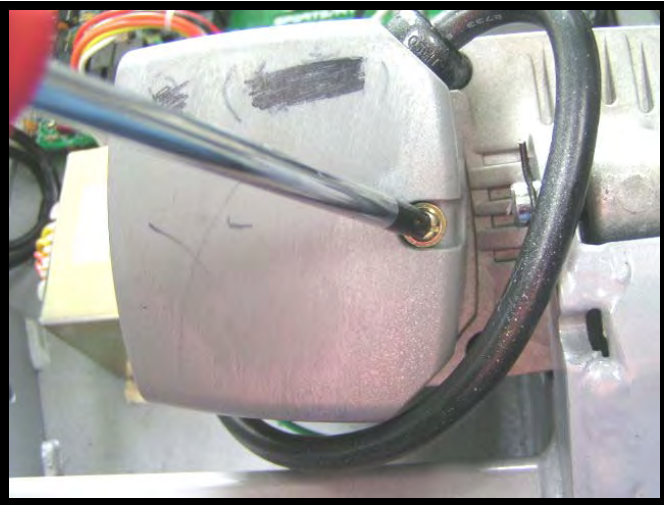
1. In QUICK START mode, press the STOP key. Or, in the PROGRAM mode, press the STOP key three seconds.
2. Turn off unit power. Then turn on unit power.
3. When the model number scrolls across the display, the incline declines until the calibration switch is hit, then the drive board LED8 ZERO indicator lights. In operation, the INCLINE window shows 0%, indicating incline calibration has been completed.

AC Incline System Calibration – Hardware

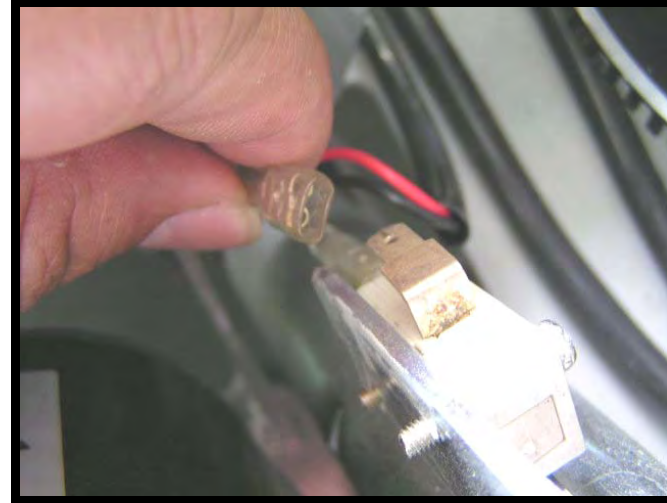
1. Prop up the unit frame.



3. Remove the incline motor cover.



2. Disconnect the calibration switch wire.



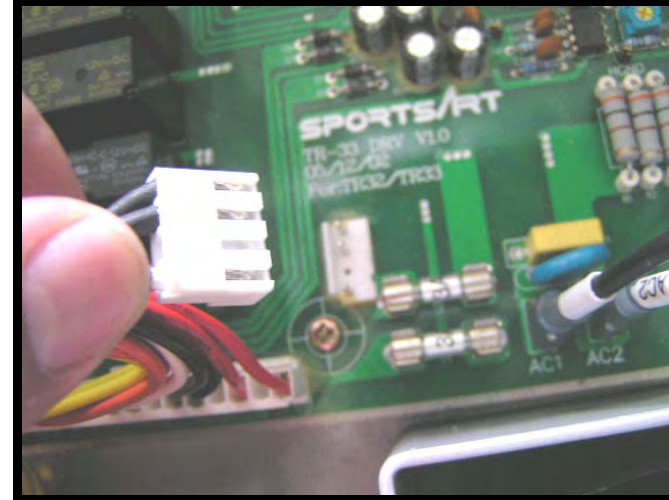
4. Press the incline down key to make the incline decline fully. Once the incline stops operating, turn off unit power.



5. The AC incline motor decline limiter operates.



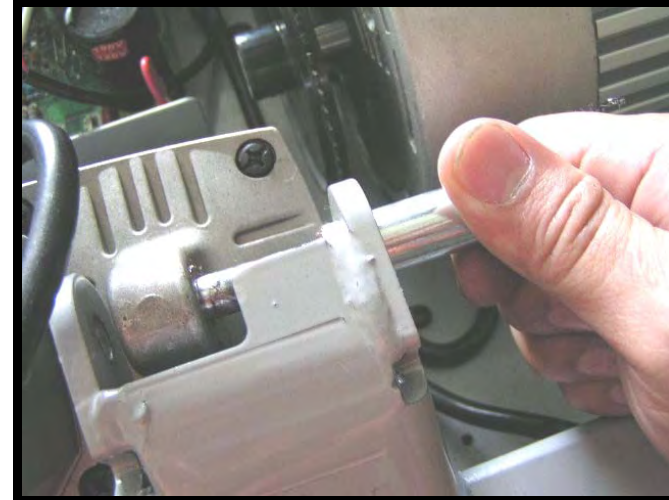
6. Disconnect the CON6 connector and ground.



7. Remove the (lower) kotter pin and incline pin.



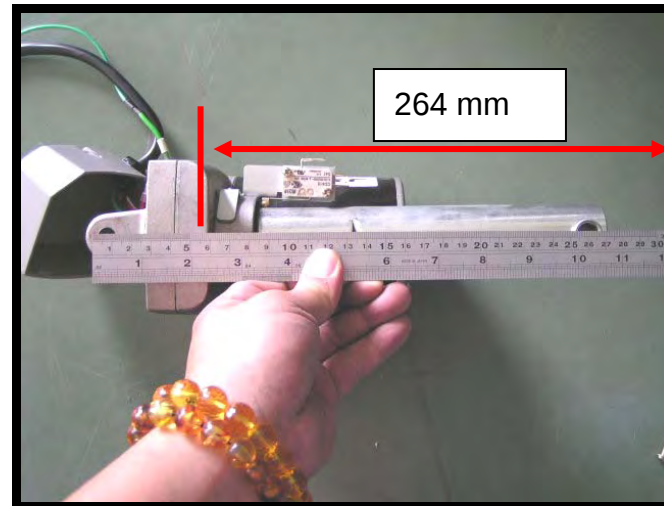
8. Remove the upper kotter pin and incline pin.



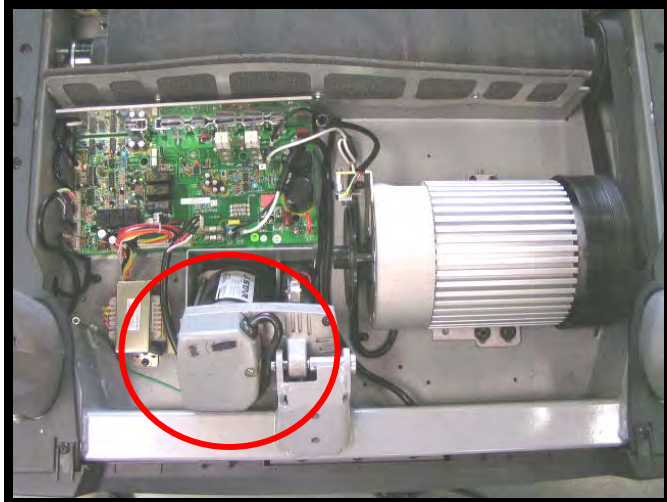
9. Remove the AC incline motor assembly.



10. Distance between both holes: 264 mm



11. After calibrating mechanically, secure the incline motor and its wire connections in place.



12. Press INC UP until the incline is 2%. Then press incline down to 0%.



13. Test the Calibration

- (a) Press INCL<▲> until the incline window shows 15%. As the incline operates upward, indicator LED 9 lights.
- (b) When the incline stops operating, LED8 extinguishes.
- (c) Press INCL<▼> until the incline window shows 0%. As the incline operates downward, LED7 lights.
- (d) When the incline stops operating, LED8 lights.
- (e) The LED8 ZERO indicator on the drive board lights to indicate completion of the calibration process.

TR33 Cushion System Calibration – Software



Software Calibration

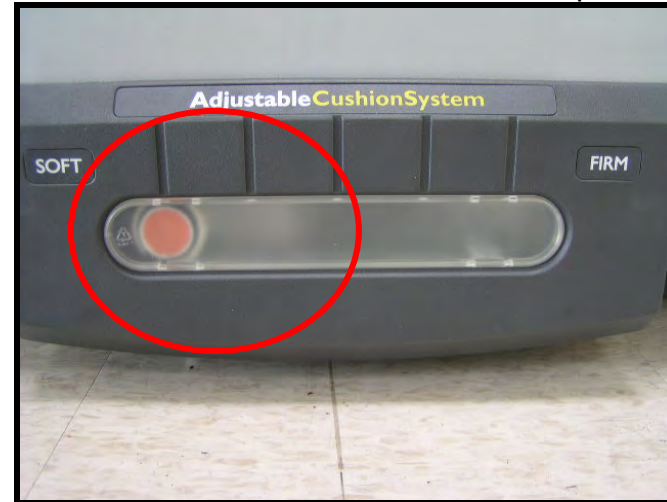
1. Press the CUSHION<▲> key until the CUSHION indicator shows 5. When the cushion motor is extending, LED4 lights.
 2. Press the CUSHION<▼> key until the CUSHION indicator shows 1. When the cushion is retracting, LED3 lights.
 3. Press the CUSHION<▲> key until the CUSHION indicator shows 3. When the cushion motor is extending, LED4 lights.
- At this time, the CUSHION motor moves to the set position, indicating completion of the calibration process.

Cushion System Calibration – Hardware

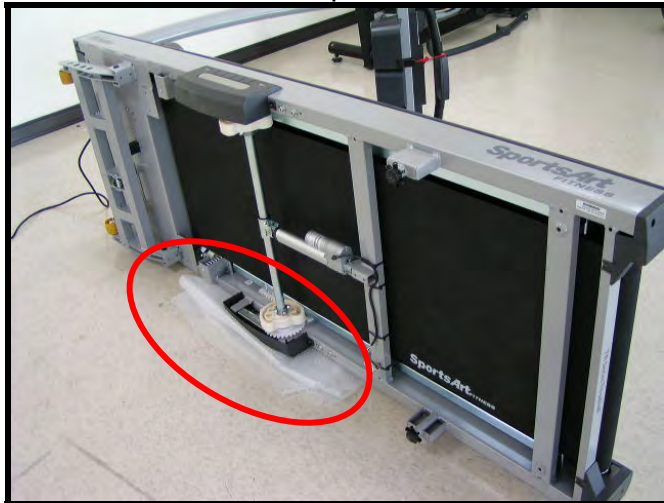
1. Press the key so position 1 indicator lights.



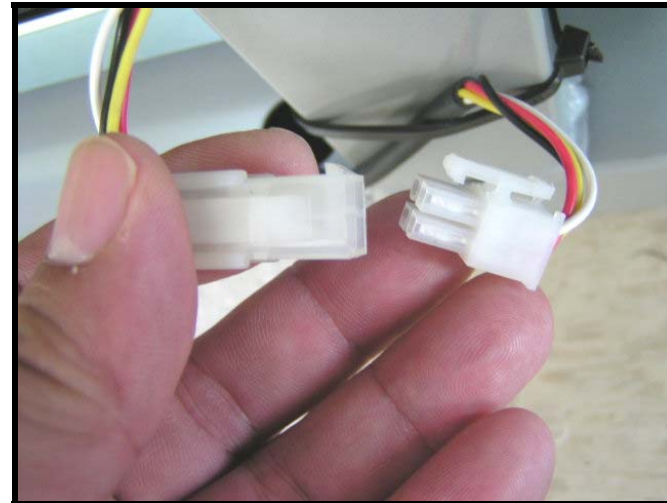
2. The cushion motor moves to the soft position.



3. Protect the unit, then tip it on its side.



4. Disconnect the cushion motor wire connector.



5. Cut the cushion wire zip tie.



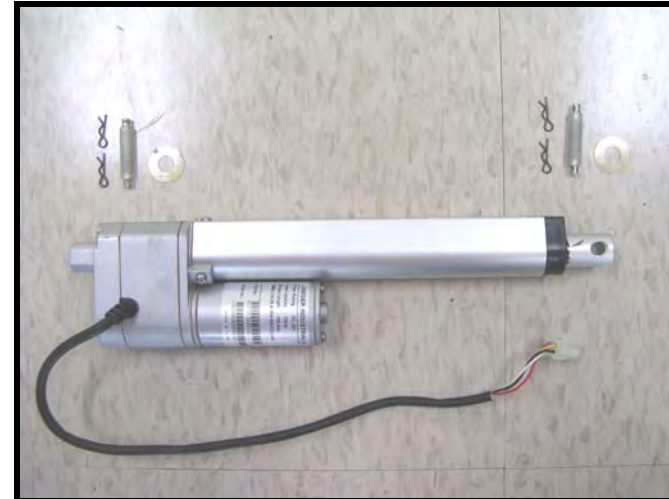
6. Remove the cushion motor kotter pin.



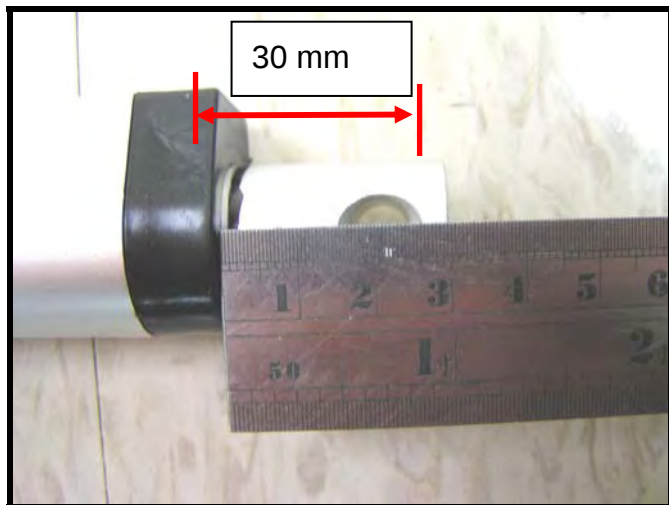
7. Remove the cushion motor rod kotter pin.



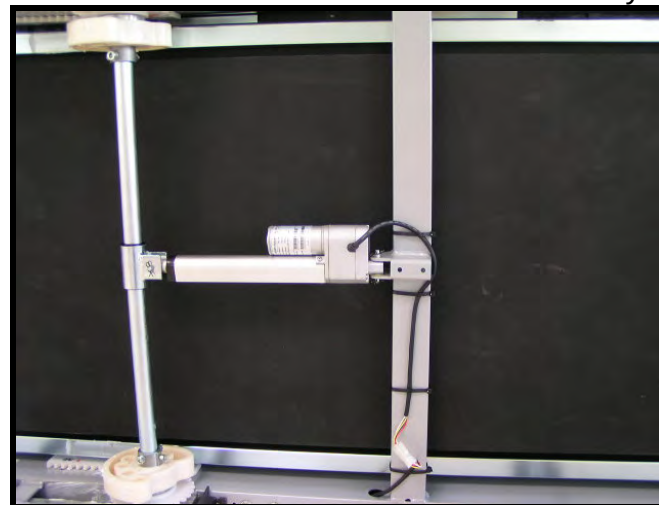
8. Remove the motor and related hardware.



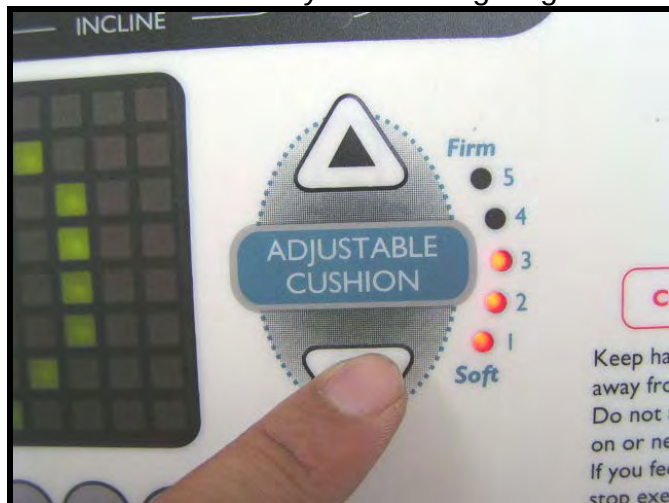
9. Set distance to 30 mm ± 1 as shown.



10. Reassemble the cushion motor assembly.



11. Press the cushion key until setting 3 lights.



12. The cushion motor operates then stops at position 3.



13. Test unit operation.

- (a) Press the CUSHION<▲> key until cushion indicator 5 lights. As the cushion motor extends, LED4 lights.
 - (b) Press the CUSHION<▼> key until cushion indicator 1 lights. As the cushion motor retracts, LED3 lights.
 - (c) Press the CUSHION<▲> key until cushion indicator 3 lights. As the cushion motor extends, LED4 lights.
- At this time, the cushion motor moves to the set position, indicating completion of the calibration process.