ST WIN

Service Manual

Nasan Medical Electronics Pvt.Ltd

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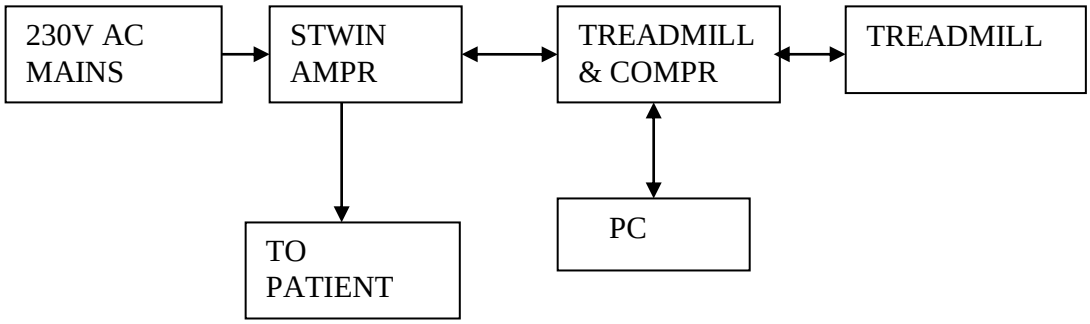


Fig 1. BLOCK DIAGRAM OF ST-WIN SYSTEM

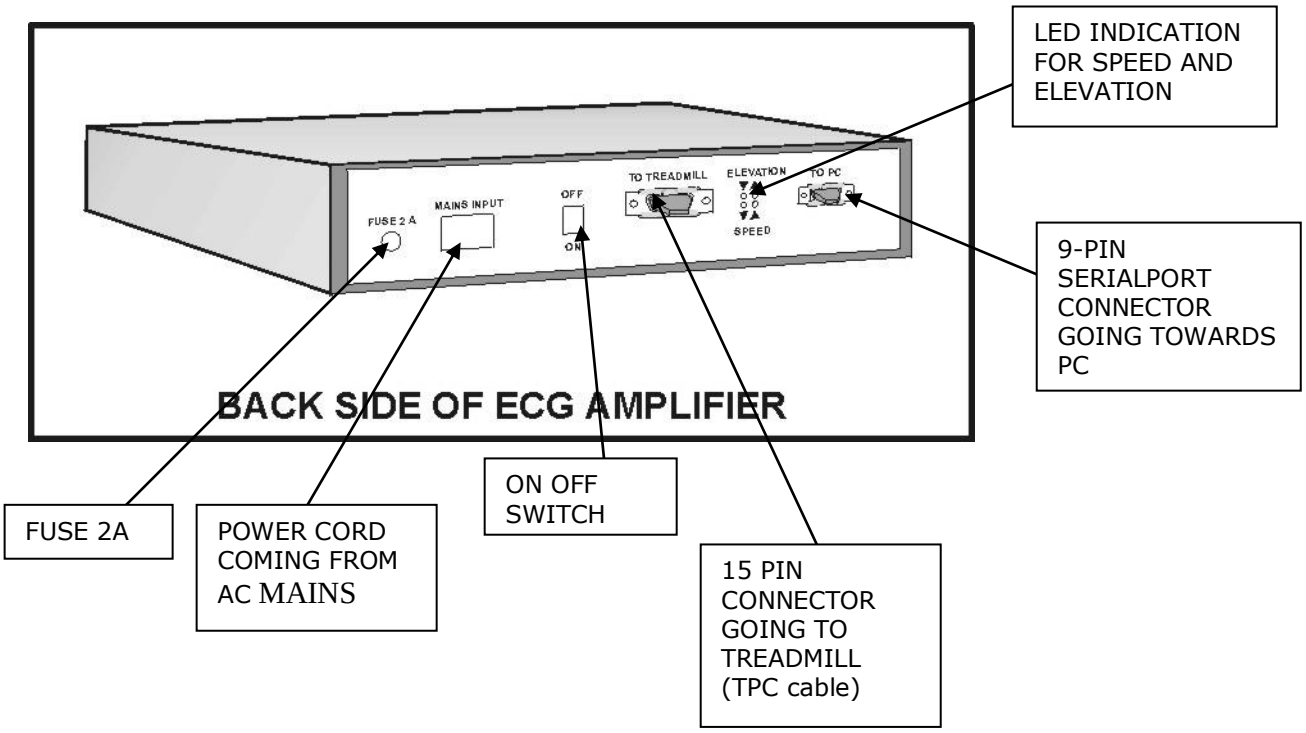


Fig 2. AMPLIFIER CONNECTIONS

4) MINIMUM SYSTEM CONFIGURATION

Minimum Requirement of PC for ST-Win system

1. Motherboard: Recommended
MAKE: D-Link/ASUS/INTEL/HIS
CHIPSET: Intel/VIA
SPEED: FSB, 400 MHz and onwards

2. CPU: Recommended
MAKE: Intel P-4, Speed 2.4 GHz, 400FSB

3. RAM: Recommended
Make: Symtronics/Hyundai/Transcend.
Size: 128 MB
Speed: 266 MHz

4. Serial Ports (RS-232): One working free serial port for ST-Win amplifier.

5. VGA card: 64-bit, 2 MB memory PCI VGA card or onboard.

6. Monitor: 14" color monitor or onboard.

7. SMPS: Recommended
Make: Priya/Mercury/Intex.
Capacity: 300 Watt.

8. Hard disk: Recommended
Make: Seagate
Size: Barracuda 40 GB 7200 RPM or onwards.

9. Display Settings: Resolution-1024*768
Font-Small font.
Color-16 bit hi color.

10. Keyboard: PS/2 with 101 keys.

11. Mouse: PS/2.

12. Operating System: Windows 98/2000/XP/Win 7

13. Stabilizer: 3.5 KVA Servos (For treadmill only).

14. CD ROM: Recommended
Make: LG/Samsung/Sony/ASUS.
Type: Speed 52X

15. Printer: Recommended
Type: HP Laser Jet 1000/HP Laser Jet 1010 of USB port
HP Laser Jet 6L Gold/Pro.

16. Independent earthing connection.

5) PROBLEMS, SOLUTIONS AND MATERIAL REQUIRED TO SOLVE THE CALL.

1) SPEED RELATED.

NOTE: - Always connect **Clamp meter** before servicing the treadmill through live wire of AC/DC card and then check current is in range.

Problem 1.	**Speed reduction in second stage and onwards**
	Background: In calculating speed of treadmill, we are adhering to the following principles: 1. We use a pmdc motor, which is required to drive the treadmill with high speed. To drive the motor and subsequently the treadmill at different appropriate speed we use dc/HF drive (Refer fig 3 top view). 2. Any medical equipment must be precise, and it should have continuous feedback. Closed feedback is maintained by following method: a. At the side of dc motor our treadmill has a heavy wheel, which is called as flywheel. There is a magnet embedded on this flywheel. At approximately **5 mm** from the flywheel, a sensor is located (Refer fig 4). b. Each time the flywheel rotates one cycle, the sensor detects it and the LED on AC/DC card flashes. If the LED is not flashing on every rotation of flywheel, then correct speed will not be detected. c. Even if the sensor is too near to the flywheel, then it will not detect the speed properly. **(Note:** It is essential that the sensor should be between **5 mm to 7 mm** from flywheel and the (d41) LED should flash when treadmill is running.**)** **Possible cause:** Generally, this happens when the sensor whose function is to sense the flywheel revolution, is very close to flywheel (Refer fig 3). The solution to this is that the distance between the flywheel and the sensor should be between **5mm and 7mm.** **Check points/Solution:** 1. Check weather sensor connection is loose 2. Interchange sensor connections wires from 2 pin relimate connector 3. If still problem persists, change ACDC drive/HF drive 4. If still problem persists change ST Win amplifier.
Material Req.	Sensor coil, silicon oil (200ml).

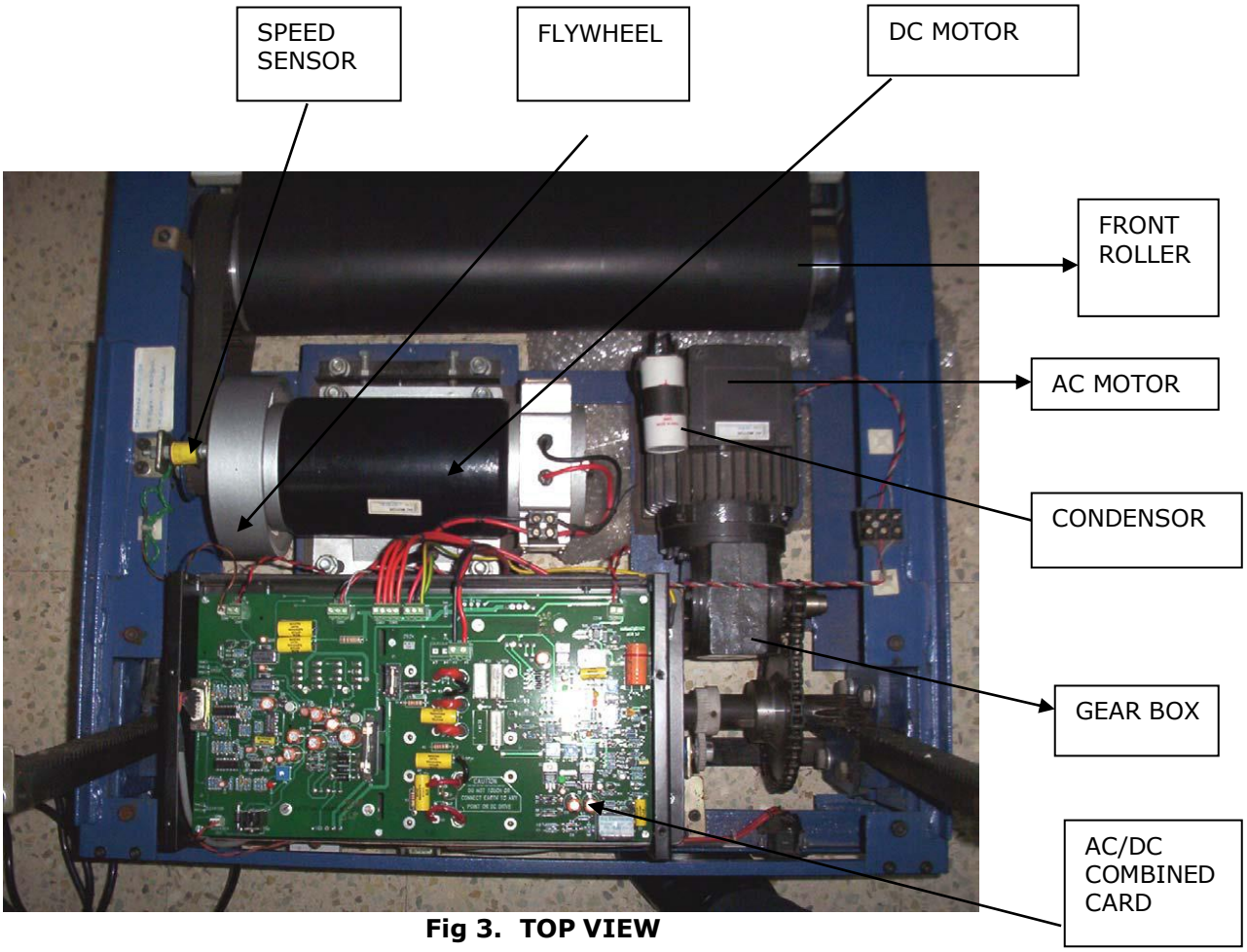


Fig 3. TOP VIEW

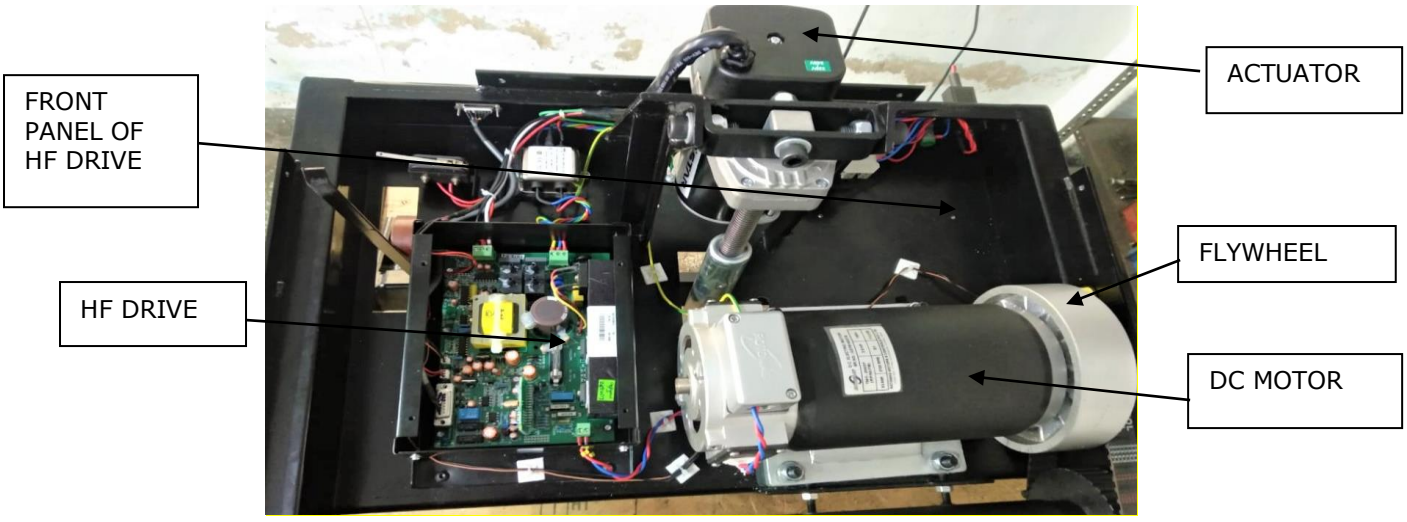


Fig 4. TOP VIEW OF HIGH FREQUENCY (HF) DRIVE

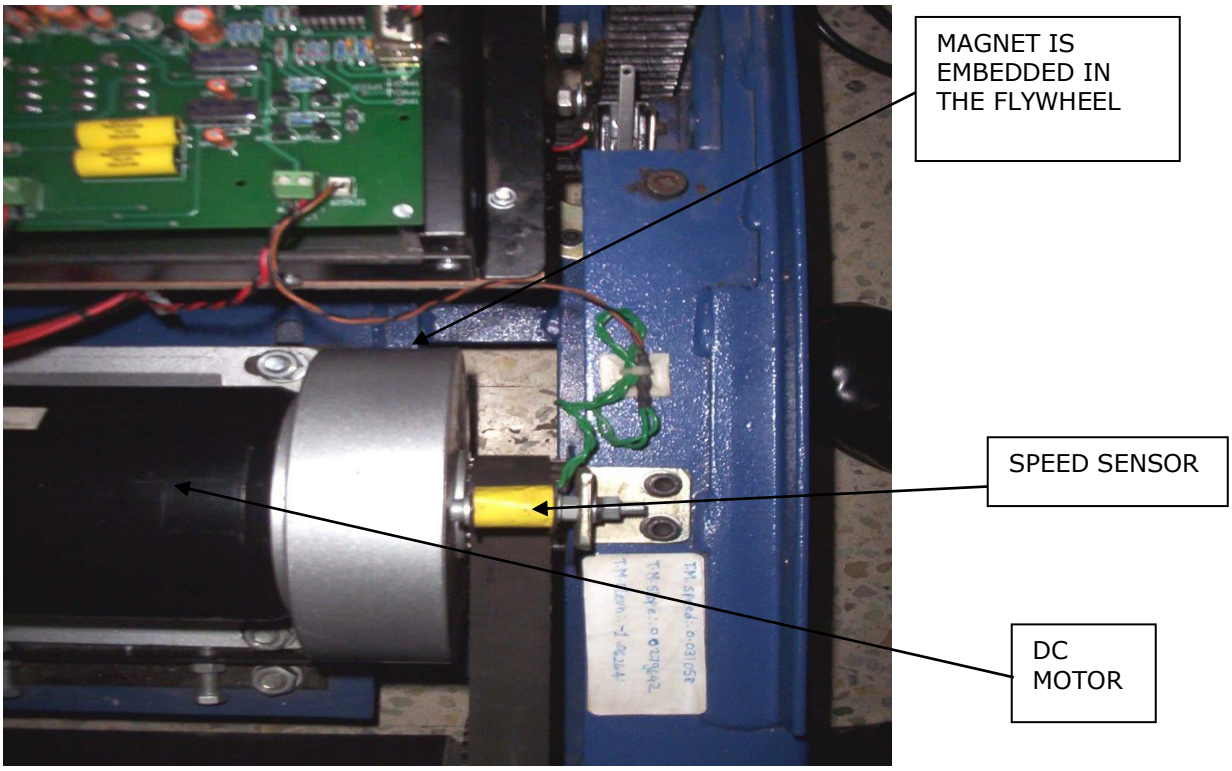


Fig 5. SPEED SENSOR

Problem 2.	**No Speed (Conveyor belt is not moving at all)**
	Check Points/Solution 1. Run test treadmill program (Refer procedure 12) and click appropriate buttons for speed increase and decrease. **2.** Observe the speed increase/ decrease LEDs on back panel of the STWIN amplifier (Refer fig 2). If LEDs are glowing, then the problem lies in TPC cable or in treadmill. **3.** But if the LEDs are not glowing then the problem lies with STWIN amplifier or calibration factors are incorrect. **4.** Check TPC cable continuity, if needed cut both ends and resolder the cable (Refer fig 13 for **Cable Details**). **5.** If belt is not moving while testing the treadmill independently then the problem probably lies on the treadmill side. First check whether the speed indication feedback LED (Fig 9) is glowing on AC/DC/HF drive. **6.** If it is not glowing, then ensure that 230-volt ac is reaching ac mains connector on AC/DC card. If 230 volt is present and still no speed, then change ac/dc drive/HF drive. **7.** The last step is to change the dc motor. But before changing do the following cold test. **8. Cold test for** dc motor**:** a. Remove 3-pin top of treadmill from mains supply. b. Remove all the two wires of dc motor. c. Ensure that there is no continuity between treadmill body and all connectors of dc motor. d. In case of pmdc motor, ensure that the armature resistance is nearly equal to 2-3 ohms.
Material	ST win amplifier, AC/DC combined card, silicon oil(200ml).

Req.	

Problem 3.	**Speed and elevation not as per protocol through software**
Solution	1. If conveyor belt is too tight then also this problem occurs. In that case loosen the belt accordingly and put silicon oil (50-100ml) under belt 2. Earth voltage should be less that 5V 3. Check continuity of TPC and serial port cable and re-solder if needed (Refer fig 13 for **Cable Details**). 4. Check voltage setting of 10k 10 turn pot setting and speed sensor alignment. 5. Calibrate the treadmill for speed and elevation. 6. Confirm that treadmill and PC, both are connected to one and the same phase only. Always give power from one and the same extension board to treadmill. 7. Though the treadmill and PC both are connected on the same phase, there might be difference in earth to neutral voltage, so short both the earth points with 24/36 wire externally. 8. Reload the software. 9. If still problem persists, change STWIN amplifier.
Material Req.	ST Win amplifier, silicon oil (200ml).

Problem 4.	**Speed goes on increasing when we switch on the treadmill (Uncontrolled speed)**
	Possible cause: 1. When the stress test is started and the program goes into the first stage, the treadmill should reach a speed of 2.7 km/hr gradually. 2. But if the speed goes on increasing continuously more than 2.7km/hr (uncontrolled), it means that the feedback path is not getting completed. **Solution:** 1) For this do following steps one by one till the problem gets solved. a) Check sensor connector is properly connected. Ensure that it is not loose also. b) Check continuity of treadmill to STWIN amplifier cable, if needed re-solder the same. c) Remove the speed sensor wires & ensure that resistance of speed sensor is nearly equal to 14 ohms. d) Check the position of magnet on flywheel and ensure that magnet is present on flywheel. e) Ensure that the (d 41) LED on AC/DC drive/HF drive is blinking. 2) If points 1/2/3 as mentioned above are correct and still this LED is not blinking, change the AC/DC drive/HF drive. (1) This problem also occurs due to failure of IC 324 or IC 374 and LM339 on PCB 141.
Material Req.	Sensor coil, AC/DC drive/HF drive, silicon oil (200ml).

Problem 5.	**Fuse blows as speed goes on increasing.**
	Background: 1. In our treadmill, the magnetic ring acts as a speed sensor (Refer fig 5). Our software takes feedback from treadmill to know the actual speed. a. If the actual speed is more than required by protocol, the software sends signal to treadmill to reduce the speed. b. If the actual speed is less than the required by protocol, the software sends signal to treadmill to increase the speed (attain the required speed). **Possible Cause:** If the **speed sensor is broken** or not at appropriate position, the feedback will be zero and the PC will consider that the actual speed is zero. Hence, the PC will keep on increasing the speed of treadmill resulting in large current drawn by ac/dc drive/HF drive. This cumulative action will result in blowing of the fuse. Check that current limit in each stage is normal. If there is a problem in ac/dc drive/HF drive, then it will take large current then normal in that case blowing of the fuse may occur. **Solution:** Change the broken speed sensor or magnet if needed.
Material Req.	Fuse, sensor coil, magnet, and ACDC drive/HF drive, silicon oil (200ml).

Problem 6.	**Jerk in speed/Speed reduces as patient walks on treadmill.**
	Possible causes: 1. No silicon oil below conveyor belt. 2. AC/DC drive/HF drive unable to provide sufficient current to dc motor. 3. Interference of DC choke radiation with speed sensor feedback. (Wrong increased speed feedback to PC). 4. Conveyor belt might be loose. **Solution:** 1. Add silicon oil (50-100ml) below the belt from both sides. 2. Here, run the test treadmill software, increase the speed up to 10 km/hr in steps of 1 km/hr. And ask a person to walk on treadmill. Here the actual speed is reducing; adjust compensation trim pot (p1) slightly so that sufficient current is supplied to dc motor (Refer Fig 9). 3. After trying above two points, if still speed reduces as patient walks on treadmill, interchange the two wires connected to choke.
Material Req.	Silicon oil (200ml), sensor coil, ACDC drive/HF drive.

Problem 7.	**Elevation is correct but speed incorrect in protocol**
	Possible causes: 1. Treadmill and STWIN amplifier not connected on one and the same phase. 2. Treadmill connected on UPS supply. (It should be on stabilizer) **Solution:** 1. Note down (i) Earth to neutral voltage, (ii). Earth to line voltage, for treadmill, PC and ST Win amplifier by removing the 3-pin power cord (Refer fig 11). 2. If the treadmill, computer, amplifier is connected on one and the same phase, you should get the same voltage measurements at all 3 points. 3. If these voltages are different at all 3 points, there is a possibility that all the three equipments are not connected on one and the same phase. 4. Another possibility is that all three equipments are not connected on one and the same earthing. 5. Remove the treadmill from **UPS** supply and connect directly on mains 230-volt ac supply. 6. Hence whenever you face such problem, first always check the above said voltages even though all mains supply connections are the same as done previously. 7. You can also refer the solution for problem no 3,4
Material Req.	Sensor coil, TPC cable, ST-Win amplifier, silicon oil (200ml).

2) ELEVATION RELATED.

Problem 1.	**No Elevation**
	Background: 1. In our treadmill the function of elevation is performed with the help of ac/dc drive/HF drive and ac motor. 2. To make treadmill understand when and to what degree it should elevate, signals are given by the PC through our software. 3. A feedback mechanism is established so that the protocol and actual elevation match. **Causes:** 1. Whenever there is no elevation then there is a problem in either the AC/DC drive/HF drive or ac motor, which elevates the treadmill. 2. The problem lies in the feedback mechanism. 3. The feedback mechanism consists of 10 k 10 turn pot, AC/DC card and TPC cable. 4. If the treadmill does not elevate, then ac motor may be jammed due to long inactive period of 2-3 months. **Solution:** 1. Switch off treadmill, open the top cover, rotate shaft of the ac motor manually by hand. In this way elevate the treadmill nearly up to 3rd stage elevation. **Warning: Do not put any sort of oil at the shaft of** ac motor **to make it free. This will burn the windings of the** ac motor**.** 2. Whenever there is a no elevation do the following steps: 1) Run test treadmill program (Refer procedure 12) and click appropriate buttons for speed increase and decrease. 2) Observe the LED on the back panel of STWIN amplifier

	3) If corresponding LEDs are glowing, then do the next step. But if the LED is not glowing then the problem lies with STWIN amplifier, or the calibration factors might be wrong. 4) Disconnect the treadmill to STWIN amplifier cable and short pin 1 & 7 of the 15-pin d type connector (the place from where you have disconnected the cable on treadmill side) and check whether the treadmill is elevating. 5) If the treadmill is elevating, then the problem most likely lies on STWIN amplifier side. This problem occurs due to a. Low voltage below 180v b. Due to shortage of limit switch pins c. Failure of condenser(capacitor) d. 10k pot settings got disturbed
Material Req.	10 k 10 turn pot, STWIN amplifier, silicon oil (200ml).

Problem 2.	**Treadmill runs smoothly for first couple of stages, after that it elevates randomly.**
	Background: 1. The 10 k 10 turn pot acts like sensor for elevation feedback. 2. On the shaft of the pot a plastic wheel is mounted. This wheel is engaged with plastic ring having teeth, which is mounted on pinion (metallic rod to which pot is engaged). 3. As the treadmill elevates up or down, the pinion rotates accordingly. This results in rotation of pot. 4. Depending on this rotation of the pot, the feedback voltage changes. **Possible Cause**: If the engagement between pot and pinion gets misaligned, the pot will not rotate properly, and the feedback will not be proper. This will result in wrong elevation or random elevation. **Solution:** Change 10 k pot if existing pot is not getting set. (Refer procedure 2, Changing of 10 K 10 turn pot, page- 26).
Material Req.	10 k 10 turn pot. In amplifier, problem rise due to failure of IC 324 on 2K 20156, silicon oil (200ml).

Problem 3.	**Treadmill stuck /elevates to its top position**
	1. Check treadmill manually by removing TPC cable. 2. Check treadmill manually from 15 pin connector on ac/dc drive/HF drive. If working, fine. If not working, then remove AC motor's connections from acdc card and put in extension board to check AC motor. 3. **Connections:** Grey+Black→DOWN Grey+Red→UP **Warning:** Do not put red and black simultaneously it will physically burn the ac motor. If motor is working, then change AC/DC drive/HF drive. **Possible cause**: STWIN amplifier not working. **Solution**: 1. Change the STWIN amplifier. 2. Recalibrate the treadmill check the treadmill through test treadmill option. 3. If still problem persists, isolate the treadmill from PC and test the same independently for elevation as given in procedure **'Independent testing of treadmill'.** (Procedure 1, page-26**) 4. If the problem persists, replace AC/DC card.

Material Req.	AC/DC drive/HF drive, AC motor, silicon oil (200ml).

Problem 4.	**On/Off switch (mcb) of treadmill trips down**
	Possible cause: Due to sudden large spike or high voltage, ac/dc drive**/**HF drive may be short-circuited. **Solution**: 1. Isolate the treadmill from PC by removing treadmill to STWIN amplifier cable. Switch on treadmill. 2. If still mcb trips, change AC/DC drive**/**HF drive.
Material Req.	AC/DC Drive/HF drive, silicon oil (200ml).

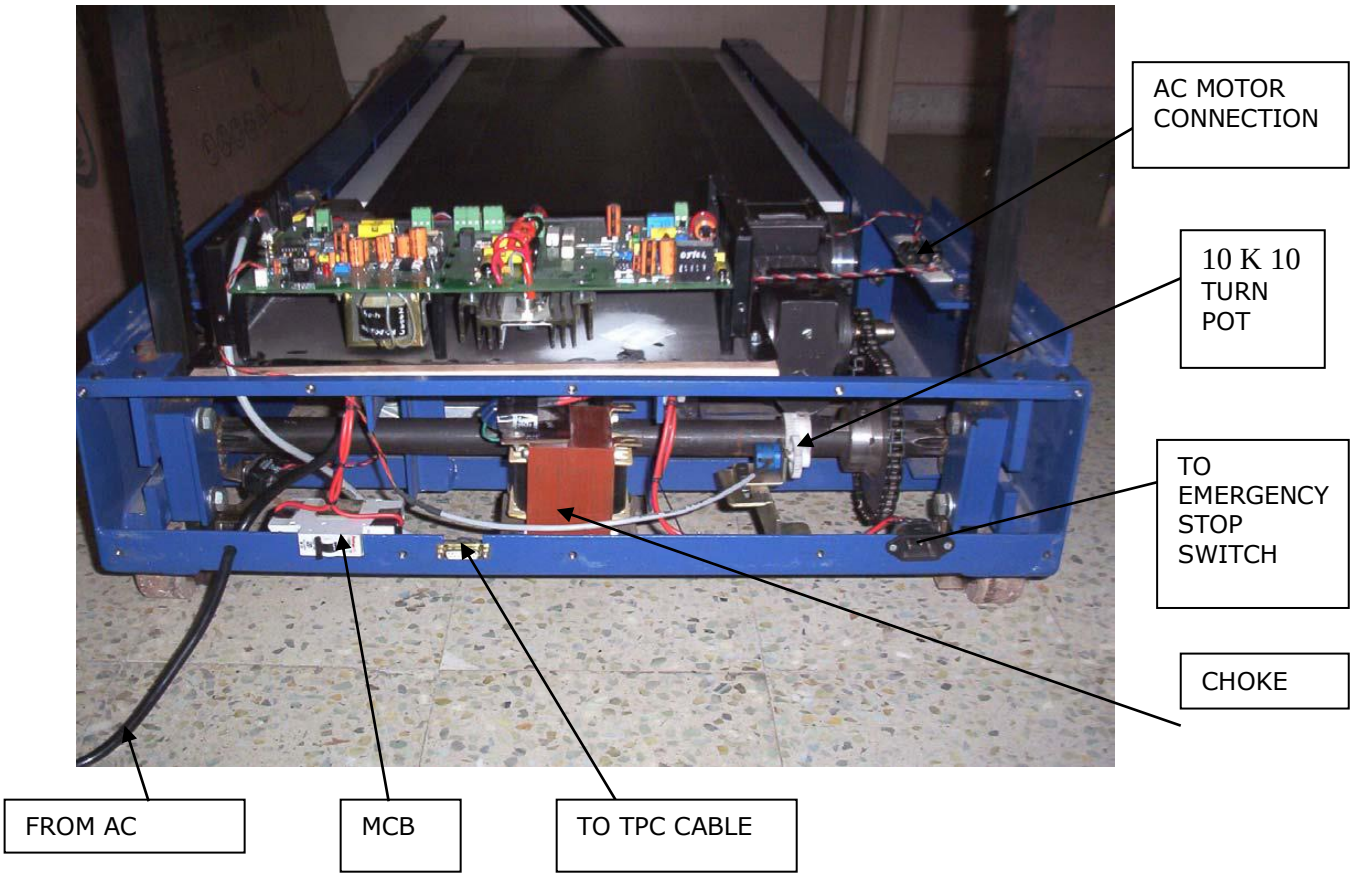


Fig 6. FRONT PANEL CONNECTION

Problem 5.	**Treadmill elevates properly up to 1st stage only and no further elevation.**
	Possible cause: Treadmill not calibrated. **Solution:** Calibrate the treadmill as per user manual. 10k 10 turn pot setting might get disturbed or it is faulty.
Material Req.	10k 10 turn pot along with 33 t gear wheel, silicon oil (200ml).

Problem 6.	Treadmill elevates /de-elevates slightly
	Possible causes: 1. AC/DC card not working. 2. Capacitor 33uf/440 volt becomes leaky/faulty. 3. Ac motor may be faulty. **Solutions:** 1. Switch off treadmill; remove TPC cable from treadmill end. 2. Remove back cover of treadmill. a. Switch ON the treadmill; short pin no. 1 & 7 of 15- pin d type connector. b. Here if the treadmill does not elevate up and the relay on the ac/dc card is also not making any clicking/audible noise, the ac/dc card is faulty and needs to be replaced. c. The same is also applicable for de-elevation. Short pin no. 1 & 8 of 15- pin d type connector. d. Here if the treadmill does not come down and the relay on the ac/dc card is also not making any clicking/audible noise, the ac/dc card is faulty and needs to be replaced. 3. In continuation to above test, if the relay on the ac/dc card is making any clicking /audible noise, and the elevation/de-elevation is taking place by a very small amount, then the 33uf/440-volt capacitor need to be replaced. 4. So, change the capacitor by a new one. This capacitor is to be changed directly. It cannot be tested on multimeter or on 230-volt ac supply alone. Check Input voltage to ACDC it should not be less than 180 v. 5. If treadmill is elevating and de-elevating properly independently from 15 pin d type female connector, but elevating or de-elevating slightly in test treadmill or calibration program, then STWIN amplifier needs to be replaced. First, check 10k 10 turn pot setting. 6. Even after changing the capacitor, the elevation /de-elevation does not take place, the ac motor needs to be checked. 7. For this, switch off the treadmill; remove mains 230-v supply to treadmill. Mark the connection details of three wires according to their position. (Color-coding cannot be mentioned because out of three wires, 2 wires are green. And if these wires are interchanged, instead of elevation, de-elevation will take place. Here if treadmill is already at ground level, further de-elevation will not take place and you will get confused) Isolate the three wires coming from ac motor. Measure the resistance between all pairs of these 3 wires. You should get resistance around 28 ohms. If you get zero resistance or infinite resistance, ac motor is faulty and needs to be replaced. **How to check** AC motor **independently:** 1. Remove three wires coming from AC motor to ACDC drive/HF drive 2. Put grey wire in neutral and red wire on live for elevation up 3. Put grey wire in neutral and black wire on live for elevation down **Warning: Do not put red and black wire at a time, it will burn motor.**
Material Req.	AC/DC drive/HF drive, capacitor, ac motor, 10k pot, silicon oil (200ml).

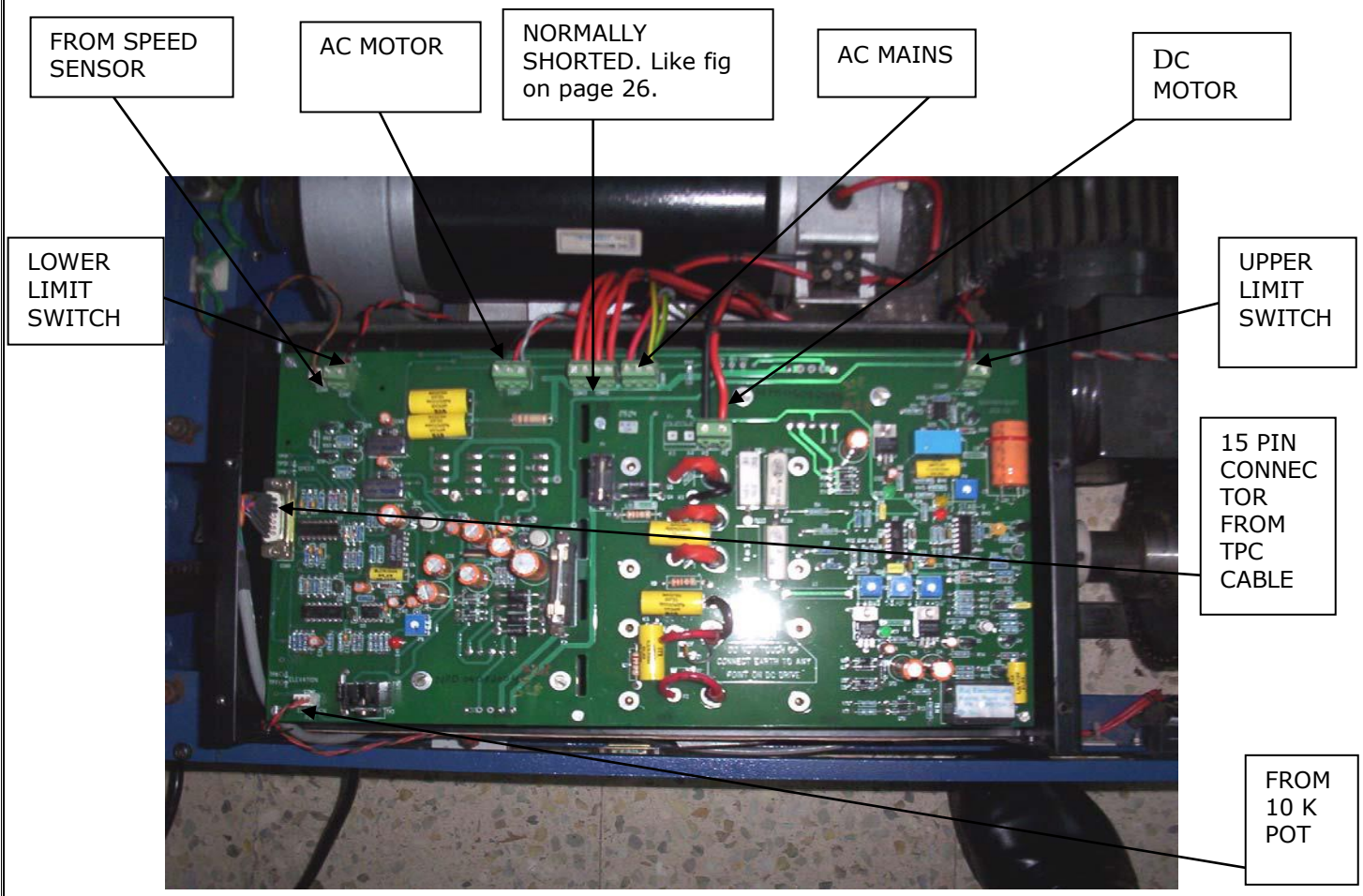


Fig. 7 AC/DC COMBINED CARD CONNECTION

Problem 7.	**No medians and no heart rate.**
	Background: 1. In stress test, sometimes it happens that patient is connected to stress test, and all the leads are displayed properly but there are no medians. 2. In our stress test, heart rate is counted depending upon the number of R waves appearing in QRS detect lead. 3. If this QRS detection lead has very low amplitude of R wave (less than 0.4cm), then heart rate cannot be calculated. **Cause:** If heart rate is not calculated, then the medians will also be not displayed. **Solution:** 1. Change the QRS detection lead from menu option so that the Q detection lead is with tall R wave. 2. Amplify the QRS detection lead. 3. Increase the gain. After doing any one of above three options, wait till the heart rate settles to correct value. Once the heart rate settles, click relearn button buttons 3 to 4 times so that the medians get updated correctly.
Material Req.	Software CD.

Problem 8.	**While coming down treadmill not stopping**
	Possible Cause: Bottom limit switch might be loose. Because of this, when the treadmill elevates it goes up but while coming down it does not stop. The bottom switch does not operate; it must not be getting pressed. It might be out of its original position, because of this 11t sprocket can get damaged **(Note: While fitting limit switch use plain and spring washer from top side of the bolt and from bottom side use plain washer spring washer and nut).** **Solution:** 1. Check the bottom limit switch position whether in alignment with the treadmill. 2. Make the limit switch tight if it is loose.
Material Req.	Plain washer, spring washer, bolt nut for limit switch.

Problem 9.	**Slow speed and slight elevation before 1st stage.**
	Possible causes: - 1. PC configuration less than P-III 550 MHz. 2. Treadmill not calibrated for speed and elevation. 3. Treadmill and amplifier, both not connected on one and the same phase. 4. Problem in amplifier. **Solution:** 1. If PC configuration is less than P-III 550 MHz such as Celeron, this problem will occur. Hence always use PC configuration, which is higher than P-III 550 MHz. 2. During speed calibration, at last stage, the computer tells us to press any key when treadmill speed reaches to zero. Here if you press any key before the speed reaches to zero, this slow speed will occur in **supine, standing, and hyperventilation** stages. Hence during speed calibration always wait till the speed becomes zero in last stage. 3. If treadmill and amplifier, both are not connected on one and the same phase, this problem may occur. Hence always ensure that the treadmill and the amplifier, both are on same phase, and both should be connected on one electrical extension board. 4. If after checking all above possibilities, if still problem exists, change the amplifier and re-calibrate treadmill for speed and elevation.

3) SOFTWARE RELATED.

Problem 1.	**PC or ECG getting hanged while running software**
	Possible causes: Following software are running at the background 1. Web shot wall papers 2. Quick Heal Antivirus with auto-protect On 3. Screen Saver The sampling frequency of ST-WIN is 250 samples/seconds i.e., samples are read after every 4 milliseconds. Software must perform many tasks in 4 milliseconds, like reading data of 12 channels through serial port, display data in different format on screen, apply algorithms, store data on hard disk, print online automatic reports and many more. If applications other than ST-WIN like as listed above are running in the background, they interrupt processing of ST-WIN Software and problems like System Hanging, Traces Becoming Slow, Improper Traces, Spikes on QRS Complex start coming. Such types of problems may be seen with other software's like Neurowin / Necropsy and Omni watch. These software's can be seen in the right side of the Task Bar, near time display. **Solution:** For disabling these software's, right click on the icon and select disable. 1. Remove unnecessary files in startup click on start-run type MSCONFIG-startup tab 2. Then restart PC
Material Req.	Remove unnecessary files in startup. Start: 1. RUN. 2. MS CONFIGURE 3. STARTUP and restart PC. (Software can be hanged due to wrong reset procedure)

Problem 2.	**Communication Error**
	Possible Cause: 1) Serial port connection open or short check continuity or re-solder if needed 2) COM port not working. 3) COM port interface in the amplifier not working. **Solution:** 1) Check connection and reconnect 2) Try by changing the Com port. 3) Replace MAX 232 IC and connect serial port cable to amplifier and check for communication.
Material Req.	MAX 232 IC, IC 374(u34)/STWIN amplifier.

Problem 3.	**Noise in ECG when patient walks on treadmill or even if he stands on treadmill**
	Possible Cause: 1. Treadmill is not grounded to earth properly. **Solution:** 1.Check the first green wire from DC motor body is connected to black box of ACDC card 2.Check whether the second green wire from DC motor body relates to earth wire of mains into ACDC drive/HF drive 3.Check the earth wire from mains is connected to chassis. (Please refer fig 12 for better idea of earthing).
Material	

Req.	
Problem 4.	**Error of DAO setup or error as 'STWIN 98-mdb 'file not found.**
Solution	For the software's after version 3.74, we have observed that the old DAO Setup is not sufficient. So, we have developed new DAO setup which is already been supplied with ST-Win Software. Install new DAO setup wherever there is new installation or up- gradation.
Material Req.	Software CD.

Problem 5.	**Error as 'STWIN 98-mdb' file missing. When we install DAO Setup for St-Win 3.74 from CD ROM, it works fine. But when we remove the CD, then an error as '.mdb' file missing comes.**
Solution	While installing DAO Setup, it is taking the source path as default path. That's why when we install DAO Setup from CD ROM and remove the CD; it can't find required files from CD ROM. For installing DAO Setup and NASAN Software, you are requested to follow the steps as, 1. Install NASAN software from CD. 2. Copy DAO setup from CD to C:\progrm files\nasanstwin. 3. Install DAO setup from this folder. Install other utilities from CD. St-Win 3.74 and onwards is developed on ".net" platform which needs different DAO setup. This DAO setup is provided with St-Win 3.74. To install this, one must just double click on DAO.exe. The above written procedure is also to be followed for new DAO setup.
Material Req.	Software CD.

Problem 6.	**lead I is coming inverted**
Solution	There are two ways in which lead I may come inverted, 1) Lead I is derived from Lead II and Lead III (Lead II – Lead III). So whenever lead II is coming as straight line then lead, I come inverted. In such case we must change the amplifier. 2) Doctors are comparing our Stress Test reports with BPL's or others' stand-alone ECG machines. In stand-alone system, electrodes are placed on limbs whereas in stress test we place electrodes on chest. There is significant distance between chest and limbs, which causes increase in resistance offered to signals. Hence there is strong chance of getting difference between morphology of Stand-alone systems and morphology of Stress test.
Material Req.	

Problem 7.	**Spikes during the test due to which HR is more than actual value.**
	Possible cause: 1) Earthing may not be proper (Refer fig 12). 2) Hard disk may be less than 72000 rpm. 3) Sound drivers not installed properly or not compatible with the system.
	Solution: 1) Check whether earthing is proper or not. 2) Remove unwanted s/w like WEBSHOTS etc. 3) Disable unnecessary startup files. **Procedure for disabling.** • Go to START menu and click on RUN icon. • Type 'MSCONFIG' and click startup menu bar. • Select unwanted items and apply. 4) Install the sound drivers properly and use compatible drivers

Mat Req.	

4) MISCELLANEOUS

Problem 1.	**Treadmill becomes non-functional again and again.**
	Possible Cause: 1. No Servo make voltage stabilizer is used for treadmill even though the supply voltage is fluctuating. 2. Voltage Stabilizer is not stabilizing the voltage. 3. Type of Stabilizer is other than Servo. 4. There might be leakage current. 5. Problems due to slower configuration. **Solution:** 1. Use 3.5 KVA Servo Stabilizer for treadmill. 2. Ensure that despite changes in supply voltage at mains, the output voltage is stable. For this, change the analog meter switch of stabilizer to INPUT mode, connect digital voltmeter (D.M.M.) to output of the stabilizer. Now you are observing input voltage to stabilizer and output voltage of the stabilizer. Here the output voltage displayed on D.M.M. should not vary by more than 2-3 volts even though the input voltage changes by more than 10-20 volts. 3. If this output voltage to treadmill is also varying with changes in supply voltage, the stabilizer needs to be repaired immediately. 4. There are different types of voltage stabilizers used for voltage stabilization. One is the On-OFF type of stabilizer. Here depending upon the input voltage range, the relay inside the stabilizer operates to stabilize the output voltage. But this relay operation generates a spike at the output. This spike creates a problem to DC motor speed control circuit and hence the treadmill stops working. Another type of stabilizer is SERVO STABILIZER. This stabilizer has built-in servo- motor, which rotates continuously with change in supply voltage. The shaft of this motor selects the appropriate winding of the VARIAC to stabilize the output voltage at 230 volts. Hence there are no spikes in the output voltage of the stabilizer. 5. This SERVO type is recommended for treadmill.
Material Req.	

Problem 2.	**10K 10-turn pot getting burned.**
Solution	10K pot setting procedure is given below, 1) Remove the 15-pin TPC cable from Treadmill end. 2) Bring the treadmill down to ground level by shorting the pin no. 1 & pin no. 8. 3) Unpack the gear assembly of 10K 10 turn pot. 4) Rotate the pot & set it to get voltage across brown & black wires as 950 mv to 960 mv. 5) Fix the gear assembly in achieved condition. 6) It will set the lower limit. 7) Make treadmill UP and DOWN 2-3 times to check 10 pot gear assembly. 8) Pack the AC/DC Drive/HF drive & top cover of Treadmill. 9) Calibrate Grade through software. 10) The upper limit will be set by software. Check whether it is working properly or not
Material Req.	10K 10-turn pot.

Problem 3.	**ST Win Amplifier fuses blowing off.**
Solution	1. If the SMPS fuse has blown OFF, change the TOP 224Y IC. (Please carry soldering gun).
Material Req.	IC –TOP 224Y.

Problem 4.	**Base line wandering while test is going on.**
Solution	1. Checks the DSP IC. If not working properly change it. 2. If the unit has DIP IC, then change that IC.
Material Req.	IC's-DSP.

Problem 5.	**Noise observed on lead V6**
Solution	Change 1 battery from set of battery
Material Req.	Battery

Problem 6.	**Spike in ECG**
Solution	Use branded SMPS for PC
Material Req.	Intex make SMPS

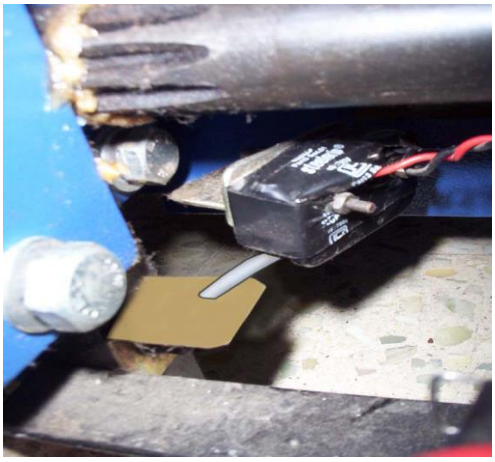


Fig 8A. Limit switch clip at its original position.

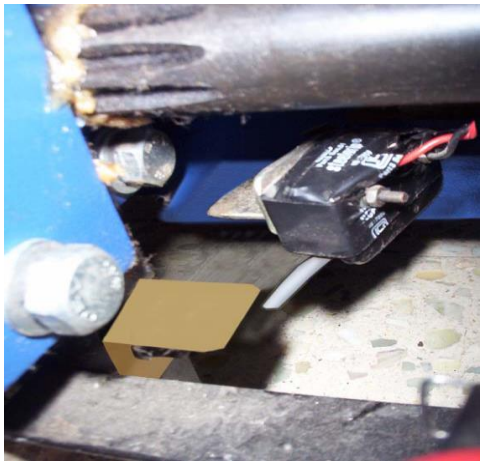


Fig 8B. Limit switch not at its position

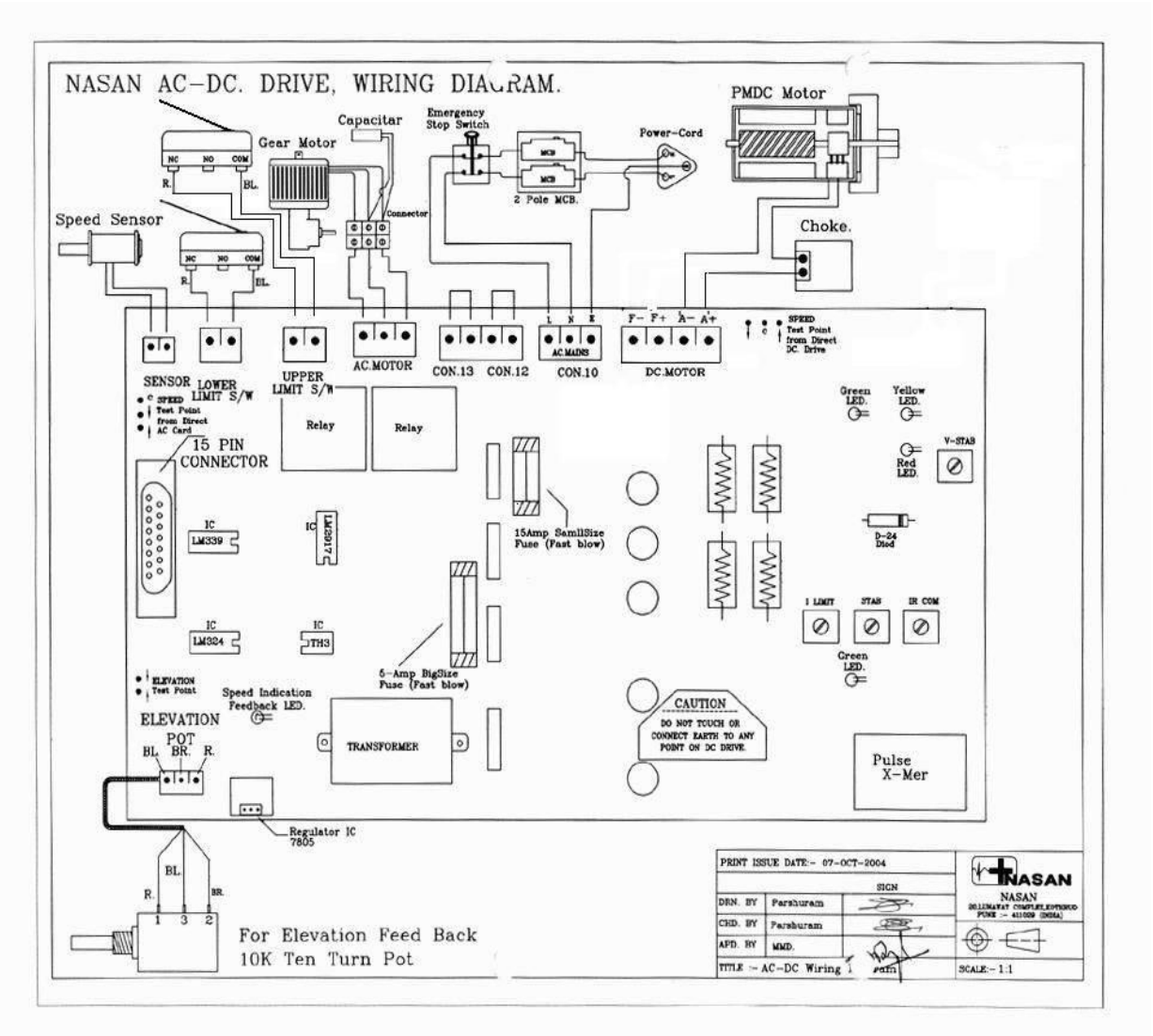


Fig 9. WIRING DIAGRAM OF AMPLIFIER

6) Appendix

A. Treadstar Table

Stage	Speed (Kmph)	Grade	Rotations	DC Motor Current(A)		Voltage Across DC Motor(V)		Noise Level	Speed feedback Voltage	Grade Feedback Voltage
				w/o load	with load	Load With	w/o	(db)	V DC (approx)	V DC (approx)
1	2.7	10	14	0.5 to 1.3	2A to 3.0	21.8	23.7	66	0.21	1.18
2	4	12	21	0.5 to 1.4	1.5A to 3.0	31.6	34.5	66	0.32	1.36
3	5.5	14	28	0.5 to 1.5	1.5A to 3.5	47.7	44.5	66	0.44	1.53
4	6.8	16	34	0.5 to 1.5	2A to 3.5	50.8	53.5	66	0.54	1.71
5	8.1	18	40	0.5 to 1.6	2A to 4 A	60.8	62.4	66	0.71	1.91
6	8.9	20	44	0.5 to 1.6	2A to 4 A	65.7	68.3	66	0.71	2.1
7	9.7	22	48	0.5 to 1.7	2A to 4.5	71.7	75.6	66	0.79	2.3

B. Ac current limit to be checked with Clamp meter (See fig.1 for how to connect clamp meter)

Stage	Speed	Grade	Rotations	Current sensed by Clamp meter (A)	
	(Kmph)			W/o load	With load
1	2.7	10	14	0.1A-0.5 A	0.1A to 0.6A
2	4	12	21	0.1A-0.8 A	0.2A to 0.8A
3	5.5	14	28	0.2A-1A	0.3A to 1.2A
4	6.8	16	34	0.2A-1.2A	0.3A to 1.8A
5	8.1	18	40	0.3 to 1.4 A	0.4A to 2.0A
6	8.9	20	44	0.3A to 1.5A	0.4A to 2.5A
7	9.7	22	48	0.4A to 1.6A	0.5A to 2.8A

NOTE: - With load current can vary somewhat.

B) Use of Clamp meter for measurement of AC current: -

Clamp meter is used to monitor the AC current taken by AC-DC card/High frequency Drive.

<u>Connecting Clamp meter to measure AC current: -</u>

1) Put the Clamp meter rotary switch in AC current measuring side at range of 200A (~)

2) Pass "Jaws" of Clamp meter through the live wire which is connected to "L" of AC-DC card/high frequency drive by pressing the knob as shown in fig.

3) When treadmill starts and current passes through the live wire of treadmill, Clamp meter senses the current and same is shown on its digital display as shown in below fig.

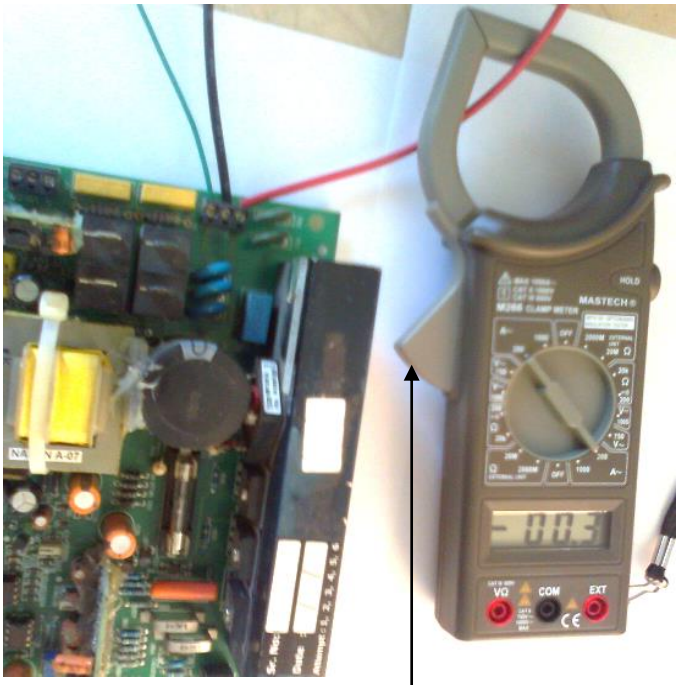


Fig10. Clamp meter connected with high frequency drive to measure AC current.

C. 15 pin connector signal details

1. +5 VDC	9. Speed Increase
2. NC	10. Speed Decrease
3. NC	11. NC
4. Ground	12. NC
5. Speed Feedback	13. NC
6. Grade Feedback	14. NC
7. Grade increment	15. NC
8. Grade Decrease	

D. Toolkit.

SR NO	NAME	SR NO	NAME
1	CLAMP METER.	14	FUSE
2	SCREWDRIVER SET.	15	SCREWS: - M 3*10, M3*15
3	PLIERS (NOSE PLIER).	16	STRAPPER.
4	SOLDER GUN /METAL.	17	WASHERS: -FIBER WASHER 3 mm.
5	BIG PLIER.	18	NUTS: - M3
6	S/W FLOPPIES/ CD'S OF ALL PRODUCTS.	19	10K 10 TURN POT WITH WHEEL.
7	CUTTER.	20	CSK& CHESEHAED
8	SPANNER SET & ALLEN KEYS.	21	SPEED SENSOR.
9	BIG SCREWDRIVER / TWEEZER.	22	FEVIBOND.
10	SILICON OIL.	23	FEVICWIK.
11	MULTIMETER & ITS RODS.	24	PIECE OF WIRE: -GREEN, BLACK, RED 14/36 3 FEET EACH
12	DISPOSABLE ELECTRODES (10 IN No.).	25	INSULATING TAPE
13	FUSE WIRE: - 5A, 15A.	26	SLEEVE
	Spares		
1	10 K 10 turn pot	5	All types of connectors,9 pin m/f,15 pin m/f
2	HDD, FDD & flat cable	6	Loose STPC & 12 PC lead set
3	Software CD, floppy	7	Serial port cable
4	IC 7805,7905,7812,7912,324,339	8	Loose ultistrand wires, insulated tape
	Documents		
1	SERVICE REPORT /AMC COPIES	5	PRICE LIST of all spares and consumables
2	DC OF MATERIAL.	6	Servicing manual
3	CASH MEMO.	7	Pirangut factory address
4	Pending payment status in that area	8	Mobile phone no list

D. Patient Preparation

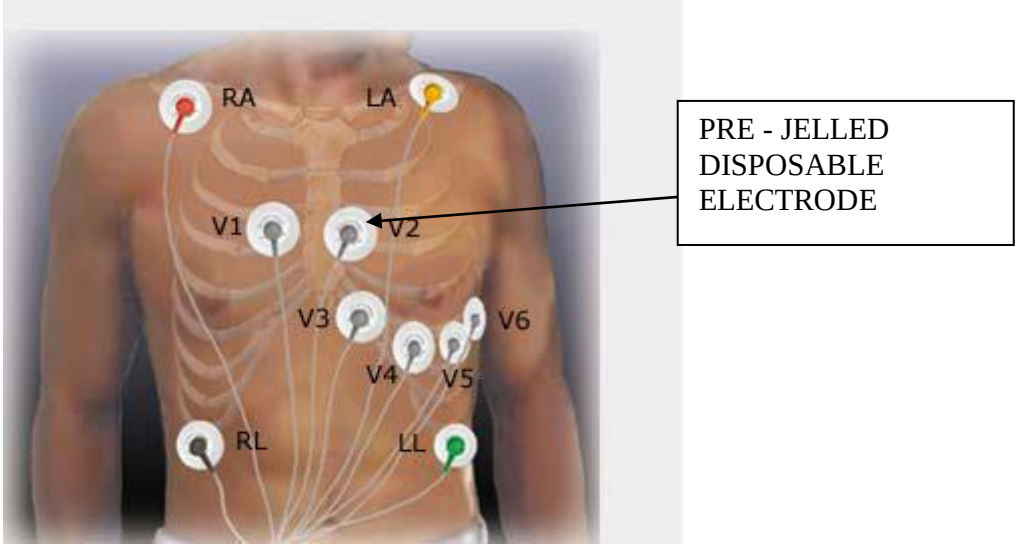


Fig 10. Electrode Site

- Shaving of electrode site is compulsory irrespective of man/woman (if electrode site is hairy)
- Wipe skin with spirit/alcohol
- Wait till skin completely dry
- Peel off the backing from pre jelled disposable electrode. The jelly pad should remain intact along with the electrode
- Place electrode one by one on selected sites as shown in figure. Press the electrodes from inside to outside covering entire electrode area
- Take care that jelled pad is in firm contact with the skin surface. Place patient lead on each electrode as per the color (the electrode has male notch while the lead has female type notch, insert the lead onto electrode)
- Apply Medical adhesive tape (dressing tape/bandage tape) across the electrode. (From loop of patient cable and apply medical adhesive tape if necessary)

E. Important Notes for servicing

1. While fitting limit switch use plain washer and spring washer from top side of the bolt and from bottom side use plain washer, spring washer and nut.
2. Whenever you work with AC/DC card, make sure that all screws are fitted properly, always use CHHD (round head) screws of M3 by 15. Also use plain and spring washers (fiber) for proper fitting.

F. Earthing

1. ENSURE THAT THE AC MAINS HAS VOLTAGE RANGE IN BETWEEN 230 V AC+/- 10%; IF THE VOLTAGE FLUCTUATES THEN USE STABILISER TO MAINTAIN THE VOLTAGE.

2. ENSURE THAT SUPPLY FOR TREADMILL, PC AND AMPLIFIER IS TAKEN FROM ONE AND SAME ELECTRICAL EXTENSION BOARD.

3. ENSURE THAT SEPARATE EARTHING IS PROVIDED AND VOLTAGE BETWEEN EARTH AND NEUTRAL IS LESS THAN 5 VOLTS. IF NOT FOUND THEN, INFORM THE DOCTOR IMMEDIATELY TO GO FOR SEPARATE EARTHING.

G. Procedures

Procedure 1.	**Independent testing of the treadmill**
Steps	1. Switch off the treadmill. 2. Isolate treadmill from pc (remove treadmill to STWIN amplifier cable at treadmill end). 3. Take a small piece of insulated wire (7-8 cm long) with its conducting ends open. 4. Switch on treadmill. 5. At rear side of treadmill, near on/off switch (mcb), a 15-pin d type female connector is located. At this 15-pin d type female connector, short pin 1 and pin 9 and check that speed increases linearly. If by shorting pins 1 and 9 does not result in speed increase, then on ac card also there is one 15-pin connector. Short pin no 1 and 9 and get the speed increase. **Do not increase the speed more than 7km/hr approx. (this speed will be reached within 5-6 seconds after shorting pin 1 & 9).** 6. Now short pin 1 and pin 10. Check that speed reduces to zero linearly. If by shorting pins 1 and 10 does not result in speed decrease, then on ac card there is one 15 pin connector, short pin no 1 and 10 and get the speed decrease. 7. Short pin 1 and pin 7 and check that treadmill elevates up linearly. After reaching top position, it will stop automatically due to limit switch. If by shorting pins 1 and 7 does not result in elevation up, then on ac card connector short pin no 1 and 7 and get the elevation up. 8. Short pin 1 and pin 8 and check that treadmill moves down linearly. After reaching bottom position (ground level), it will stop automatically due to limit switch operation. If by shorting pins 1 and 8 does not result in elevation down, then on ac card connector short pin no 1 and 8 and get the elevation down. 9. Switch off the treadmill.
Material Req.	small piece of insulated wire (7-8 cm long)

Procedure 2.	**Changing of the 10K 10 turn pot (*for elevation*)**
Steps	Ensure that the resistance of new pot (potentiometer) is continuous and variable with the help of multimeter. 1. Open back panel and top cover of treadmill. (Refer fig 11) 2. Ensure that the treadmill is at ground level. (Front portion and the back portion of the treadmill should be at equal height of about 190 mm.). 3. Adjust this level by referring to point no. 06 and 07 given on page no 01. 4. Loosen the metal part on which 10 k pot is mounted. 5. Loosen the 10 k 10 turn pot. 6. Stick the plastic wheel on the shaft of pot (new pot) with feviquick. 7. Replace the pot keeping the original connections same. a. (Refer to diagram). 8. Solder black wire to pin no 1. a. Solder brown wire to pin no 2. b. Solder red wire to pin no 3. 9. If the connections are interchanged, the pot will burn physically. 10. Switch on the treadmill.

	11. Adjust the pot such that you get 950 milli-volts between black and brown wires at con 6 connector of AC/DC card. This connector is located at left hand bottom corner of AC/DC card. Measure this voltage with the help of digital multi-meter on dc voltage range. 12. Fix and tighten the pot properly. 13. Fix the metallic part on which pot is mounted. 14. Again, ensure that the voltage between a1 and a2 is 950mvdc (tolerance of +/-4 mill volt is acceptable). 15. Ensure that the elevation up and down takes place smoothly and ensure teeth of both gears are engaged with each other properly. 16. Switch OFF the treadmill. 17. Fix the back panel again to its original position with screws.
Material Req.	10K 10 turn pot (along with 3 pin relimate connector and 33 gear wheel), multimeter

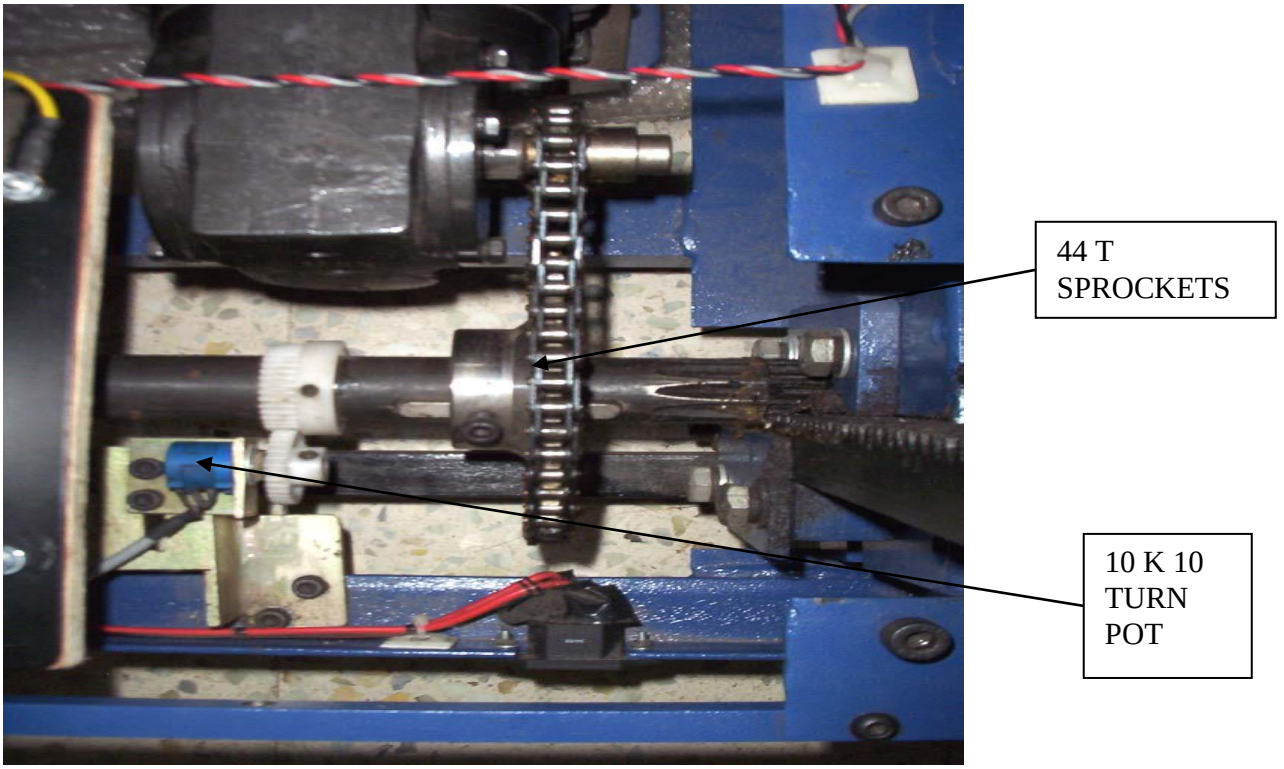


Fig 11: 10 K 10 Turn Pot.

Procedure 3.	**Procedure for changing AC motor**
Steps	1. First elevate the treadmill up. It should be at 300 mm from ground level. If ac motor is not working at all you will have to follow step no 2 2. If it is not possible, lift the treadmill and put a small stool under the treadmill at front side for supporting purpose so that both racks will become free. 3. switch of the treadmill and remove the 3-pin top from ac mains 4. remove the TPC cable from treadmill 5. Remove the link in the chain; it can be half or full link. if you find it difficult to remove the chain and fit again you may take help 9of cycle mechanic or motorcycle mechanic. 6. take out the chain from 11T sprocket this sprocket is fitted on the shaft on AC motor 7. remove the wires of the AC motor from the condenser 8. remove the Allen bolts of AC motor 9. take out the ac motor 10. Mount the gear motor with 4 nos nylon spacers of 12 mm height by M8 by 40 mm Allen bolt, nut along with plain and spring washers for Delco motor(make) **OR** Mount the gear motor with 4 no's, nylon spacers of 2 mm height by m 12 by 50mm hex bolt along with plain and spring washers for VISHWAS motor(make) 11. Loose the Allen grub screw of 44t sprocket. This sprocket is fitted on the pinion of the treadmill. **12. Align both the sprockets (11T & 44T) such that both are in one line if there is a mismatch between two sprockets, the chain will come out from wheel and the treadmill will fall from the top position, this may create an accident** 13. Fit the chain on both sprockets with the help of half link or full link. 14. Do not tight the Allen grub screw of the 44t sprockets it should be loose. 15. Solder wires of ac motor with wires of the condenser 16. elevate the treadmill up and down two three times 17. now check both sprockets aligned properly in the straight lines 18. now tight the Allen grub screw of 44t sprockets if you forget to tighten this screw the treadmill will fall from the top position 19. Check if noise is coming during elevation. 20. If noise coming from the chain, then, check the chain tension if it is loose then put washers between spacers and bolt of ac motor at back side of motor 21. Checks the Allen grub screws of both sprockets are tight. 22. take out the support stool from the treadmill
Material Req.	Spanner of size 16/17, allen key of 10mm,2.5 mm,3.0mm, 6mm, half link full link chain small piece of chain (1 ft) wires of 14/36 red grey, black

Procedure 4.	Procedure for changing DC motor.
Steps	1. Remove 3 pin top from mains and 15 pin TPC cable. 2. Remove top cover of treadmill/handles. 3. Remove all connections from DC motor. 4. Do not disturb settings of adjuster bolts. 5. Remove timer bell from Dc motor 6. Put DC motor on chassis 7. Fix the timer belt into motor. 8. Adjust the holes of Dc motor and chassis. 9. Insert M10-bolts & fix the nut accordingly (Do not tight nut bolts) 10. Do the wiring of Dc motor but do not plug-in 3 pin top to mains. 11. Set the timer belts properly (check its tension, it should either too loose or too tight) 12. Tight all four M 10 bolts 13. Check whether magnet is present on flywheel. 14. Connect the sensor along with flywheel. 15. Adjust sensor in such a way that there should be a gap between sensor and magnet from 5mm to 7mm. 16. Plug in 3 pin top check treadmill by shorting pin 1 & 9.
Material Req.	

Procedure 5.	Changing of AC Card + DC Drive Assembly to ACDC Drive Combined.
Steps	1. Switch Off the Machine and remove the 3-pin plug. 2. Open back cover of Compact Treadmill. 3. Remove all connections from AC Card and DC Drive. 4. Remove AC Card and DC Drive from Bakelite sheet including transformer. 5. Keep limit switches and speed sensor as they are. 6. Remove Bakelite sheet from its position. 7. Mark Top & Bottom sides of Bakelite before removing. 8. Place ACDC Drive on Bakelite Sheet Centrally and mark the four corners of ACDC drive box on Bakelite. 9. After marking, make drill with M6 Drill bit markings (total 4 drills). 10. Insert M5X30 mm screw from back side of Bakelite with plane washer. 11. Fit this screw from front side using M 5 spring washer then M 5 plane washer then M 5 nut. 12. Put ACDC drive box on Bakelite. See matching of Box holes with fitted screws. 13. Remove box & fit Bakelite to its original position. 14. Insert base grommet on all 4 screws (M5 X 30 mm). 15. Mount ACDC drive on 4 screws (M5 X 30 mm) & fit it with M5 plane washer, M5 spring washer & M5 nut (as in pt.11). 16. Remove top cover of ACDC drive box. 17. Bring out two earthing connections from DC Motor (Rotomag or Thyron). Connect one to AC mains socket (CON 10) on ACDC drive & other to ACDC drives corner mounting screw with earthing clip. 18. Fit armature wires coming from DC Motor in A+ and A- pins of connector CON 15 on ACDC drive. 19. If there is Thyron DC Motor, then solder "GMKDSP 3/2" green 2 pin connector at CON 15. Fit field wiring of DC Motor in 'F+' and 'F-of connector CON 15. Make sure that diode D-24 (4148) is connected on ACDC drive (for Thyron Only). 20. Solder two wires coming from speed sensor to 2 pin Relimate connector (female) and insert it on ACDC drive at CON 8.

	21. Fit wires coming from limit switches in CON5 and CON 7. 22. Fit wires coming from AC Motor in connector CON 11 as [B|R|G]. 23. Short 2 Pin MCB connector CON 13 with wire. 24. Remove old emergency switch wiring. 25. Make 10.5 mm hole on the side cover of Treadmill in line with 15 pin D type connector leaving 50 mm distance from top cover. 26. Open the Emergency Stop Box. If it is metallic, use new plastic EMG Box. 27. Take new 3 Core AC Mains cable. Cut the Yellow/Green wire as we won't require it. 28. Insert Red wire at one end of red colored connector of EMG switch and Black wire to another end of same connector. Other end of cable should be inserted in CON 12 of ACDC Drive. 29. Care should be taken while looping mains wire. It should not be loose as it may collide with Rack. 30. Mains Wiring: Bring Red wire of Mains to one end of MCB switch fitted on Treadmill and from other end on MCB bring out 2.5 sq.mm red wire, loop it at sides of ACDC Drive and connect to LIVE (L) point of AC Mains connector CON 10. Bring black wire from 3 core AC Mains cable looped at side of ACDC Drive and connect to NEUTRAL (N) point of CON 10. Connect Yellow/Green wire to Earthing Fitting screw of ACDC Drive Box (M5 X 30) using earthing clip. 31. Connect 15 Pin D type Male Connector on other side of cable which goes to 15 Pin D Type Female Connector fitted on side of Treadmill (where TPC is to be inserted). Do connections pin to pin for both connectors (pin1 & pin4 to pin11) as per diag. 32. Solder 3 pin Relimate female connector to 10K pot as per circuit diagram and insert it on connector CON 6 as [Bl|Br|R]. 33. Turn ON the Treadmill. 34. Increase treadmill speed manually by shorting Pin1 & Pin9. If belt rotates in opposite direction, reduce speed by shorting Pin1 & Pin10 of 15 pin D type connector for TPC cable. 35. Interchange A+ & A- connections at CON 15 and Check treadmill response again. 36. Check treadmill grade by shorting Pin1 & Pin7 to increase and Pin1 & Pin8 to decrease. 37. Fit top cover of ACDC Drive. 38. Fit the Treadmill cover and check with Software.

Procedure 6.	**Procedure for Removing/Replacing HF Drive PCB.**
Steps	1. Remove the treadmill shroud and disconnect from the mains power supply. 2. Remove the treadmill controller box on the top. 3. Disconnect all the wires/connections from the HF-Drive PCB. 4. Remove the PCB screws and take the PCB out carefully. 5. To replace the HF Drive PCB, place the HF Drive in the box. 6. Place screws and tighten them. 7. Plugin all the wires/connections to the HF-Drive PCB.
Material Req.	

	MATERIAL LIST REQ. TO SOLVE A CALL	
No	**Material**	**Quantity**
1	2 Pin Green Connector for Field wiring. (In case of thyron motor only)	1
2	2 Pin White Relimate (Female) Connector. (For sensor connection)	1
3	3 Pin White Relimate (Female) Connector. (For 10 k turn pot connection)	1
4	Diode 4148 (in case of thyron motor only)	1
5	Screw M5 X 30 mm	4
6	Nut M 5	10
7	M5 Plane washer	8
8	M5 Spring washer	8
9	base grommet	6
10	10 mm wire grommet	2
11	3 core Main's wire (non-shielded)	5 meters
12	2.5 sq. mm red wire	3 meters
13	2.5 sq. mm yellow wire (for earthing)	1 meter
14	14*36 black wire	1 meter
15	14*36 red wire	1 meter
16	14*36 grey wire	1 meter
17	Binding sleeve	As per requirement
18	Heat sync able Sleeve 6 mm	1 meter
19	Heat sync able Sleeve 3 mm & 1 mm	1 meter
20	Heat syncable Sleeve 2.5 mm	1 meter
21	Brass lugs	10
22	Silver lugs	6
23	Cable tie with pads	15 sets
24	Supporting mounting plates (25*5) flat	2 nos
25	Screws M5*50	6 nos
26	12 core cables	3 feet
27	15 pin d-type connector –female	1
28	15 pin d-type connector –male	1
29	ACDC/HF drive combined	1

Procedure 7.	**Changing of Actuator.**
Steps	1. Switch off the machine and remove the nut bolts to uncover the assembly. 2. First fix the actuator box on the actuator by using M 10X 50 mm HEX bolt and 10 mm nut. Use Plain and spring Washers, Use Lock tight for M10 Nut. 3. Now put this block on the chassis and fit it by using M 12X30 mm Hex bolts using plain and spring washers, in the top side of the chassis. Use Lock tight. 4. Now fit the Actuator end point on the base Assembly by using M 10X70 mm Allen Bolt. Use plain, spring washer and M10 Nut and lock tight. Make sure that the actuator shafts thread should have two threads visible.

Upper and Lower limit switch setting Procedure:

Open the top cover of the actuator there are two limit switches in the Actuator i.e., Top and Bottom. The identification, for the top or upper limit switch this is on top side and the other is lower/bottom limit switch. There are two nylon pointed gears, these operate the limit switches. The top gear stops the upper limit switch and lower nylon pointed gear stop the lower limit switch. Make sure that the bottom limit switch is operated. To set this switch, loosen the star screw which is fitted on nylon Pointed gear. To set the lower limit switch move this nylon pointed gear, which is in the bottom side, to the lower limit switch from the right side of the limit switch, this will be operate from the right side. Now tighten the screw which is on the nylon gear.

5. Now give power supply to actuator through mains i.e., 230 V AC. Use **white** wires as common wire and use **red** for up movement and **black** for down movement. After elevating the actuator to its maximum level make sure that there should be 8 mm gap in between actuator sleeve and base assembly square tube. Now set the upper/top limit switch in Operated position.
6. Now connect the white and Black wires to the mains, machine should go down, take at the lower position check the actuator threads two threads should be visible, then fix the lower limit switch.

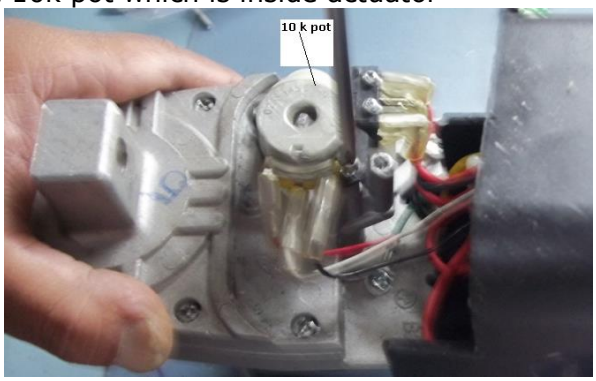
   Now connect the actuator through ACDC/HF Drive externally and connect Pot wire also, the treadmill should go completely down direction, check Voltage on white and black wire of the pot. It should be 900MV (+/- 100 MV) if not as per above mention value, then open the top cover of the actuator, remove the left-hand screw of the pot, and loosen the right-hand screw and adjust it to 900 MV and fix it properly.

Actuator pot setting step:

1) Treadmill at down position.

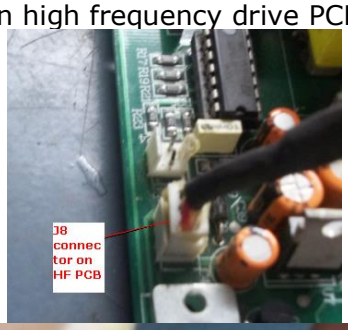
2) Remove actuator cover

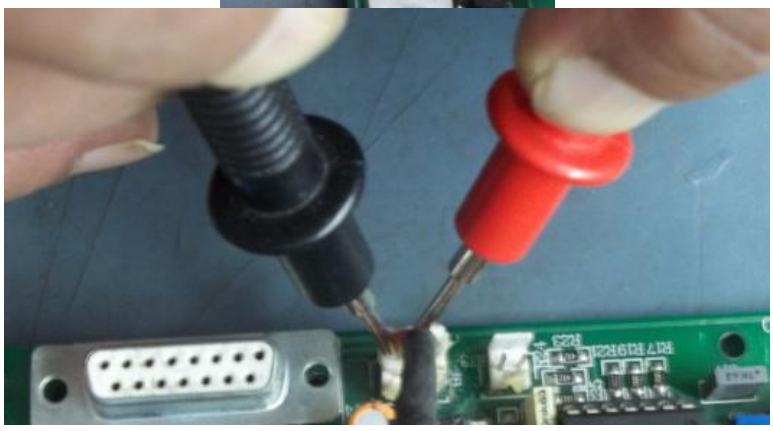
3) Remove 10k pot which is inside actuator



4) Switch ON treadmill

5) Connect multimeter black probe (common) at pin 3 of J 8 connector which is on high frequency drive PCB 2k8005v3





6) Connect multimeter red probe at pin 2 of J 8 connector which is on high frequency drive PCB 2k8005v3

7) Keep multimeter on DC voltage range

8) Rotate pot to set voltage between 250mv to 900mv

	 9) Now fit pot in actuator and check voltage remains between 250mv to 900mv. During fitting due to gear rotation set voltage may get change 10) Fit actuator cover 11) Do treadmill calibration.

Procedure 8.	**Changing of Rollers.**
Steps	**Procedure for changing BACK ROLLER.** 1. Switch off the treadmill and remove the 3-pin plug. 2. Remove end caps of the treadmill. 3. Loosen the M 10X100 Allen bolts. 4. After loosening the bolts, back roller is shifted in front direction. 5. The belt is then loosened. 6. Loosen the M 10X30 bolts by using M8 Allen keys. 7. Remove the Wooden board. 8. Remove the 4 wooden board support angles by M 10X 20 Allen keys. 9. Now completely remove the M 10X 100 Allen bolts so that the roller is completely free for removal (Take another person for help because the roller is heavy) 10. Fix new roller in that place. 11. Apply reverse procedure for fixing new roller. 12. Take care while setting the conveyer belt that it does not misalign anywhere. **Procedure for changing FRONT ROLLER.** 1. First remove the back roller by referring the above procedure. 2. Loosen the M 10X100 Allen bolts of back roller. 3. Remove the front roller locating plate by loosening the M 6X 16 Allen bolts. 4. Lift the front roller so that the timer belt is removed. 5. Then remove the front roller so that new roller can be fixed. 6. Apply reverse procedure for fixing the front roller.

Procedure 9.	**Changing of Rack and Pinion.**
Steps	1. Give some support to the m/c and elevate to some height. (Use small stool for this purpose). 2. Remove the front and back covers to open the assembly. 3. Remove all connecting wires, handles etc. 4. Remove the DC Choke, ACDC card, 10 K pot along with mounting plate.

	5. Remove the support ply and limit switch. 6. Remove chain lock and chain (Take help of cycle mechanic if not possible). 7. Remove the right and left rack support plate. 8. Now remove the grub screw and pinion can be removed from the chassis.

Procedure 10.	**Changing of Magnet.**
Steps	1. Switch OFF the machine and remove the front and back cover. 2. Rotate the flywheel manually so that magnet is in accessible position. 3. Loosen the bolts and remove the magnet. 4. Replace with new magnet.

Procedure 11.	**Changing of Limit Switch.**
Steps	1. Switch OFF the machine and remove the 3-pin plug. 2. Remove the front and back cover to expose the assembly to the person. 3. Remove the connection wires from the ACDC/HF drive. 4. Remove the M 3X 30 Allen bolts to remove the limit switch from limit switch mounting plate. 5. Replace the old limit switch with new one. 6. Use the same old wires for connection if they are not damaged else use new. 7. Align the limit switch according to the stopper plate. 8. Switch ON the treadmill. 9. Test the limit switch manually, i.e., whether it stops when touched with finger.

Procedure 12.	**Changing of Conveyer Belt.**
Steps	1. Switch OFF the m/c and remove the 3-pin plug. 2. Mount the 46 L pulley on the front roller.M6 X6 mm grub screw is being used to fix the 46 L pulley on to the roller by a key of 8 X 8 X 25 mm. Front roller assembly is prepared and fitted on to the chassis. 3. Loosen all 4 mid support angle of the chassis and align them in one straight line. 4. OSL board to be kept on the above 4 angle (locating it at 15 mm gap from 46L pulley+centering of OSL board with respect to the chassis). Then make all base points on to the OSL board through drill of 11mm and a counter sink of 22mm drill. Dismantle all the 4 support angles by numbering them. 5. Now take the conveyer belt and roll it on the front roller. 6. Then roll it on the back roller. After that push the wooden board inside the conveyer belt and adjust its position properly.

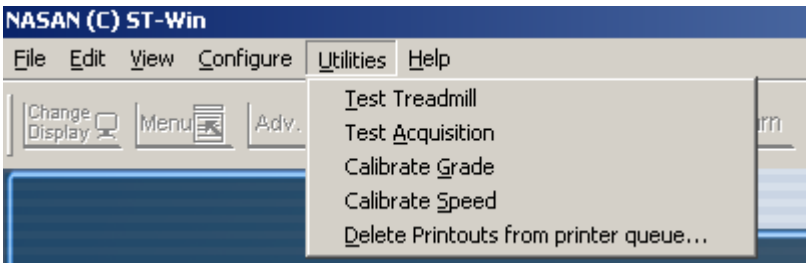
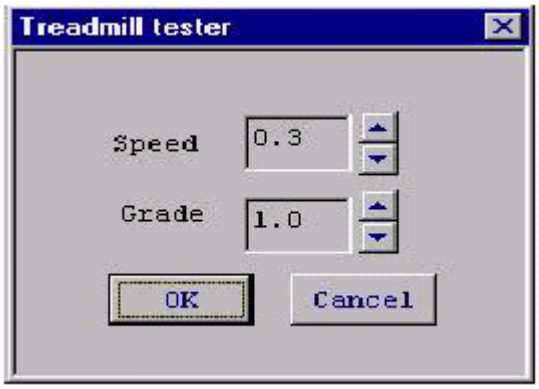
Procedure 13.	**Standard calibration procedure.**
Steps	**1.** Go to '**Utilities**' menu to do the following connecting work, Test treadmill. Test acquisition. Calibration grade. Calibration speed. Delete printouts from printer queue.  **Utilities.** **2. Test treadmill** For testing the Speed and Grade of the treadmill select the '**Test treadmill**' option from '**Utilities'** option. A dialog box is displayed as shown below with speed and grade buttons. User can test the treadmill by increasing / decreasing the speed and grade buttons by pressing the arrow button seen on the dialog box.  **Treadmill tester** **3. Test acquisition** '**Test acquisition**' is used to test the connectivity between the amplifier and PC port. When you click on '**Test acquisition**' option the message will come**" Please switch ON the amplifier."** In case of any loose contact or other problem, error message "**The hardware unit is not working properly**" is displayed. **A) Calibrate grade** For calibrating the grade of the treadmill go to the '**Utility'** menu and press **Calibrate grade**' option. A dialog box will appear on the screen as shown in fig 1.

Fig 1

1. When the treadmill reaches to its maximum elevation press '**OK**' button. When '**OK**' button is pressed treadmill starts moving down and following message as shown in fig 2 is displayed.

Fig 2

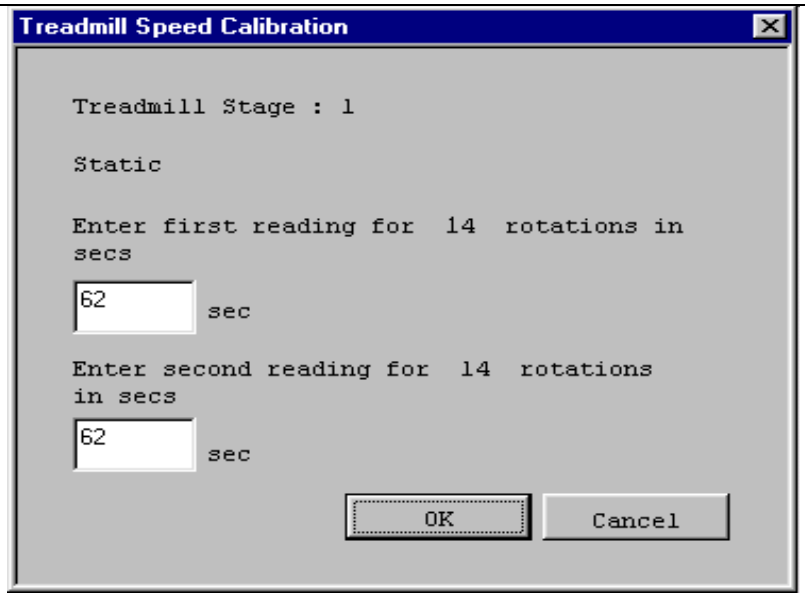
2. After the treadmill reaches its minimum elevation press '**OK**' button. When '**OK**' is pressed calibration constants for grade are calibrated and stored. These calibration constants are displayed in ST-Win configuration dialog box.

3. If an error is detected this message appear on the screen,

Fig 3

B) Calibrate speed

For calibrating the speed of the treadmill go to '**Utility**' menu and select '**Calibrate speed**' option. This will display the dialog box as shown in the figure below. Count the number of seconds for 14 rotations and enter the number in the edit box. Do this for one more time and enter the count in the second edit box. Press '**OK**' button to move to next stage of the protocol.



Treadmill speed calibration.

Above explained process will be carried out upto 7 stages of BRUCE protocol.
Conduct test in BRUCE protocol and fill following table:

Stage	Speed(kmph)	Belt (RPM) Approx.	Allowed Time in sec	Actual time in sec
1	2.7	14	55-67	
2	4.0	21	55-68	
3	5.5	28	54-66	
4	6.8	34	53-64	
5	8.1	40	52-64	
6	8.9	44	52-64	
7	9.7	48	52-64	

At the end of 7th stage, speed calibration constants are calculated and saved.

Treadmill Speed constant, Treadmill Slope, Treadmill Elevation constant are displayed in ST-Win configuration dialog box.

For Treadstar XP actual time taken and hence speed for each stage is within allowed limits. Hence treadmill is calibrated.

C) Store configuration settings on floppy. ----Now this feature is not used

Settings done using configure menu option or through '**Configure system'** button on Installation dialog box can be stored on a floppy. For this purpose, go to '**Utility**' menu and select the option '**Store configuration of setting on floppy**'. All the setting will be copied to floppy.

D) Restore settings from the floppy. --Now this feature is not used

Choose this option from **'Utility'** menu to install the setting saved on the floppy. When pressed this button, setting stored in the floppy are restored in the newly installed software.

	E) Delete printouts from printer queue … To delete printouts from printer queue, go to Utility and select **'Delete printouts from printer queue. .**'Option. **'Printer and Fax' dialog box** will be displayed. Select the printer which is connected to ST win unit and double click on it. It will display those documents stuck in the queue and if those documents in the queue are not required then right click on it and select 'cancel' option. It will delete the documents in queue.

H. Precautions:

1. Precaution to be taken while testing the AC-DC/HF drive

1. Do not touch any part on dc/HF drive except its cover during ON condition. Otherwise, you will experience a hazardous shock and the DC/HF drive will be damaged.

2. As the AC/DC/HF drive is floating, do not connect earth or ground to it. This will damage the dc motor circuit of the card.

3. While interchanging AC/DC/HF drive, always refer to wiring diagram.

2. Earthing:

The Earthing for the system should be proper. This is to ensure patient safety and for no interference of line voltage fluctuations. For correct earthing procedure, refer to work order booklet and get it done and approved from licensed electrician only.

If the earthing is not proper, leakage currents may pass from the amplifier to ground through the patient. If the current magnitude is large, it can be harmful for the patient.

3. If earth wire is showing 0 Volt, check whether it is connected or not.

5. General precautions for using the treadmill-

Read this section before operating the treadmill. Keep the area underneath the treadmill clear.

Do not start the treadmill when someone is standing on the belt.

Do not leave a patient unattended on the treadmill.

Do not stop the treadmill if someone is walking on it except in case of emergency.

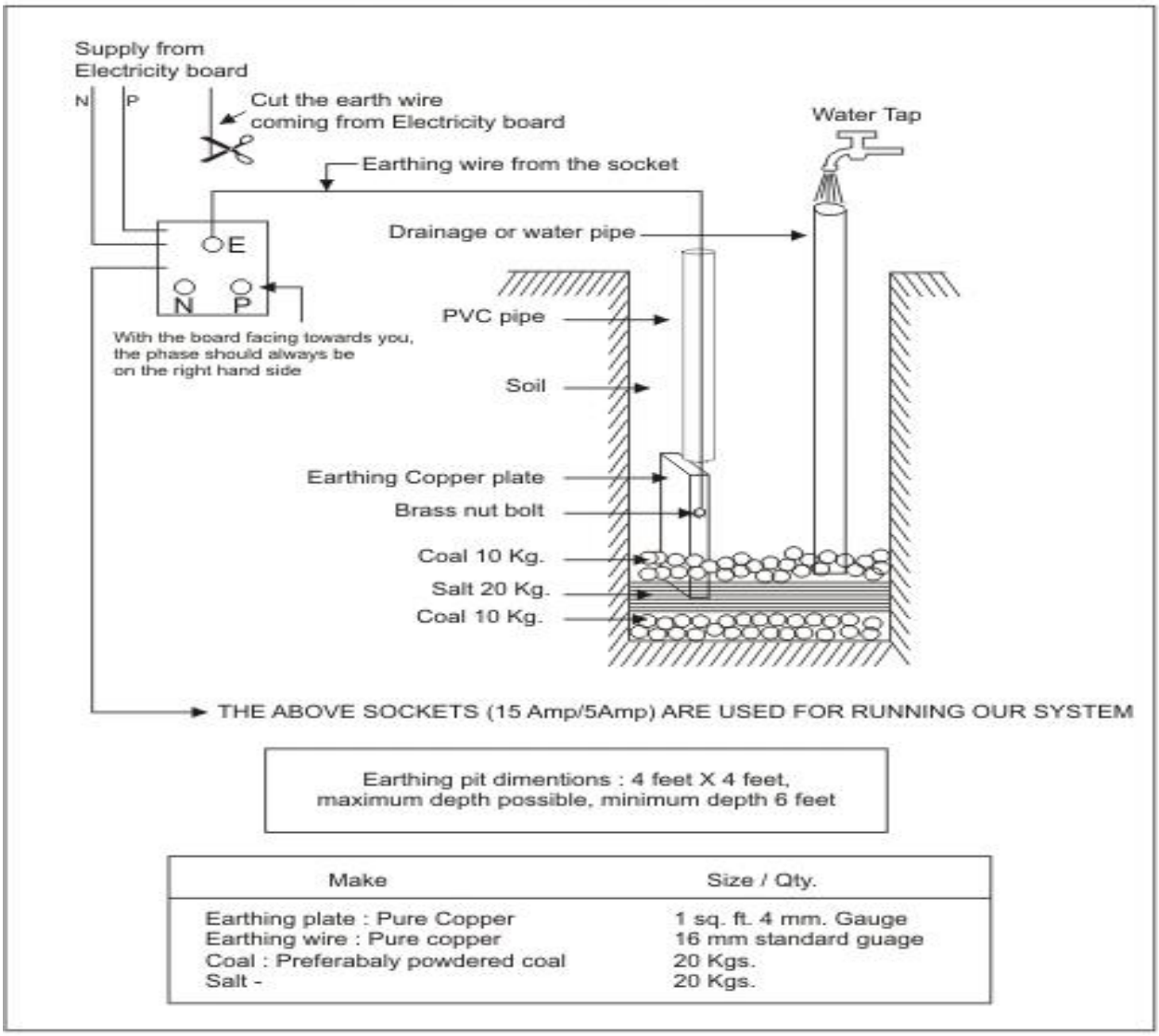
Keep speed and grade at minimum when patients are getting on the treadmill.

6. Check voltage before replacing/touching any part.

EARTHING

Note : - Please see that the earthing pit should be at the nearest distance from the site of the Machine. Earth to neutral voltage should be less than 5 volts. Please see that the specifications shown in the Diagram below are fully achieved. Please take help of an expert local electrician for earthing.

Practical layout of earthing which has proven to give satisfactory working of system



Make	Size / Qty.
Earthing plate : Pure Copper	1 sq. ft. 4 mm. Gauge
Earthing wire : Pure copper	16 mm standard guage
Coal : Preferabaly powdered coal	20 Kgs.
Salt -	20 Kgs.

Earthing should be preferably done near the drainage system else there should be frequent watering of earth pit once in 5 months

Fig 12. Earthing Procedure

Checking of voltages:

1) **Earth to neutral voltage: Insert the pins of multimeter between E and N.**
2) **Earth to live voltage: Insert pins of multimeter between N and P.**

CABLE DIAGRAMS

1. TPC CABLE DETAILS.

15 Pin D type (M) conn	15 Pin D Type (F) conn.	Color
04	04	Orange
05	05	Yellow
06	06	Green
07	07	Blue
08	08	Violet
09	09	Grey
10	10	White
11	11	Pink

****Short Shield to pin no 4 of (F) conn.**

2. High frequency (HF) drive (Front panel to HF drive)

15 Pin D type (M) conn	15 Pin D Type (F) conn.	Color
01	01	Not connected
02	02	Black
03	03	Not connected
04 (Only wire)	04 (Wire + shield)	Brown
05	05	Red
06	06	Orange
07	07	Yellow
08	08	Green
09	09	Blue
10	10	Violet
11	11	Not connected
12	12	Not connected
13	13	Not connected
14	14	Not connected
15	15	Not connected

2. STWIN TO SERIAL PORT CABLE DETAILS.

09 Pin D type (M) conn pin no.	09 Pin D type (F) conn pin no.	Color code
02	02	Black
03	03	Green
05	05	Red
Shield open and cut	Shield open and cut	

Servicing Treadmill Controller and Body level used with High Frequency Drive

CONTENTS

1. System diagrams and connections: -

1) SYSTEM DIAGRAMS:

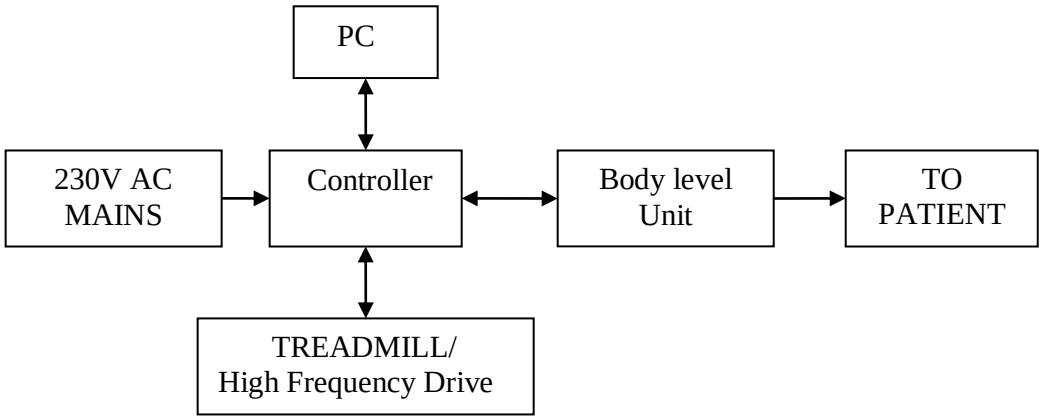


Fig 1. BLOCK DIG. OF Treadmill Controller SYSTEM

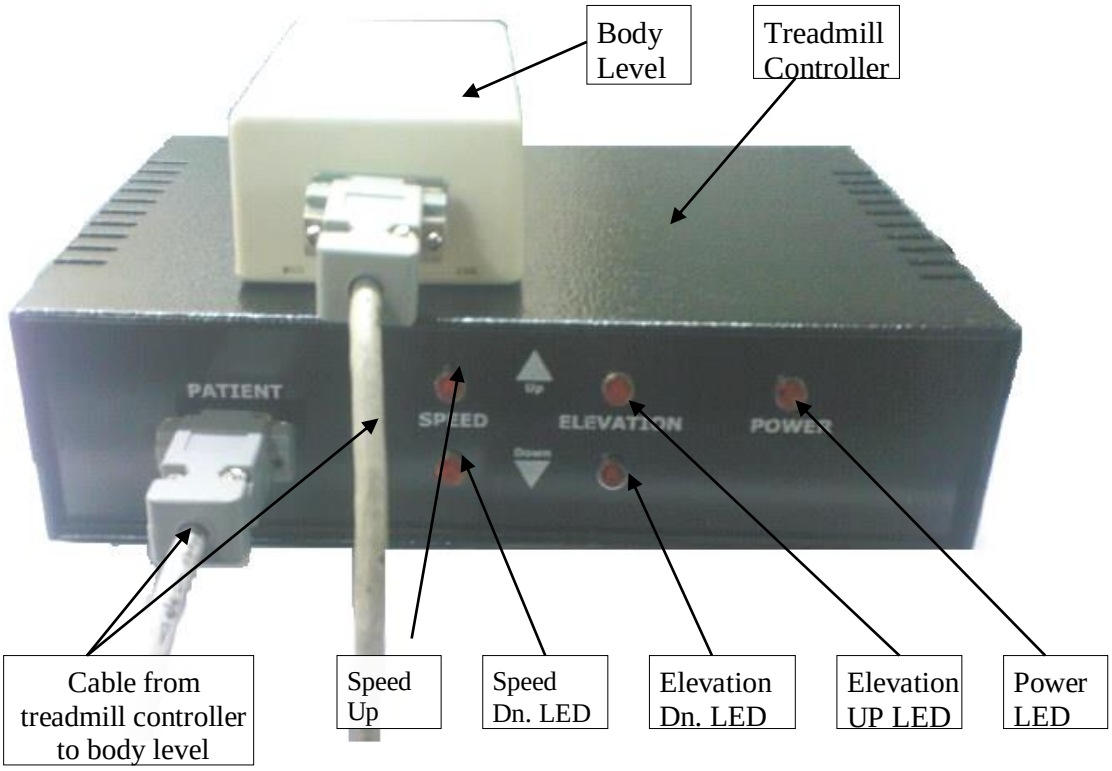


Fig 2. Treadmill Controller + Body level system.

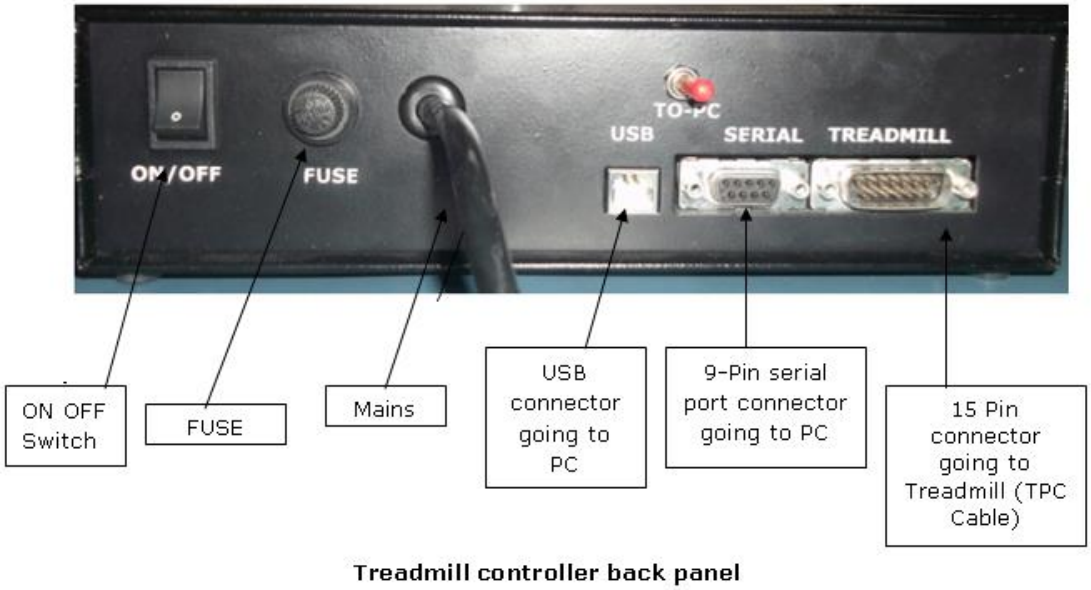


Fig 3. Back Panel of Treadmill Controller system

2. Photos of serviceable parts (PCBs): -

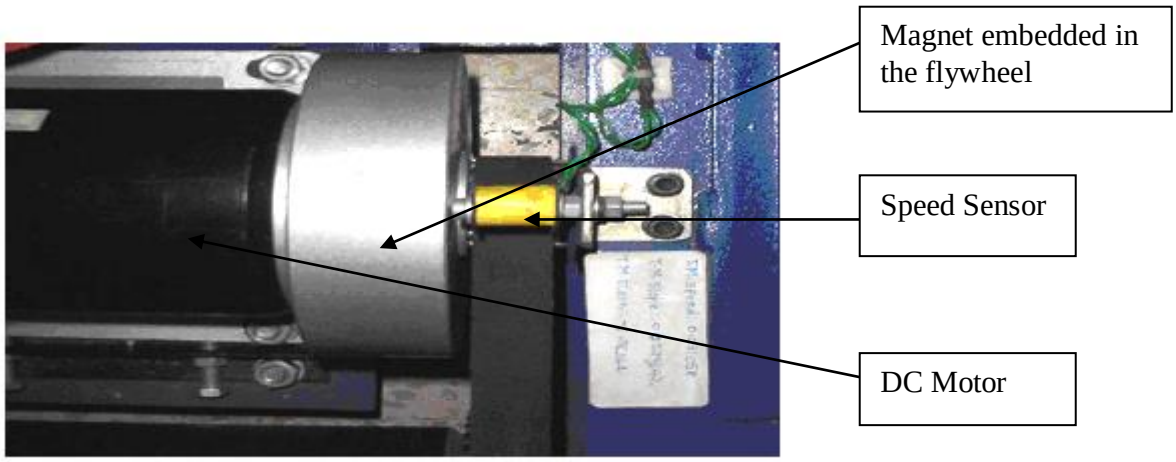


Fig 4. SPEED SENSOR

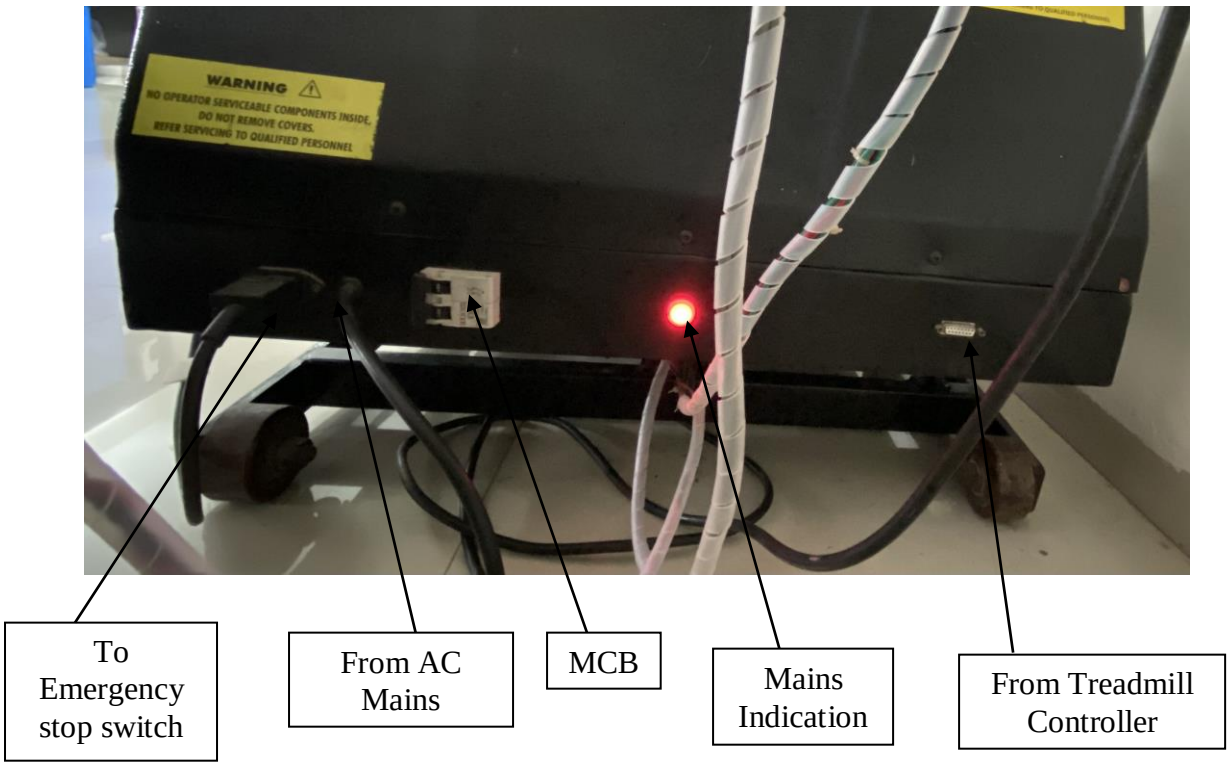


Fig 6. FRONT PANEL CONNECTION

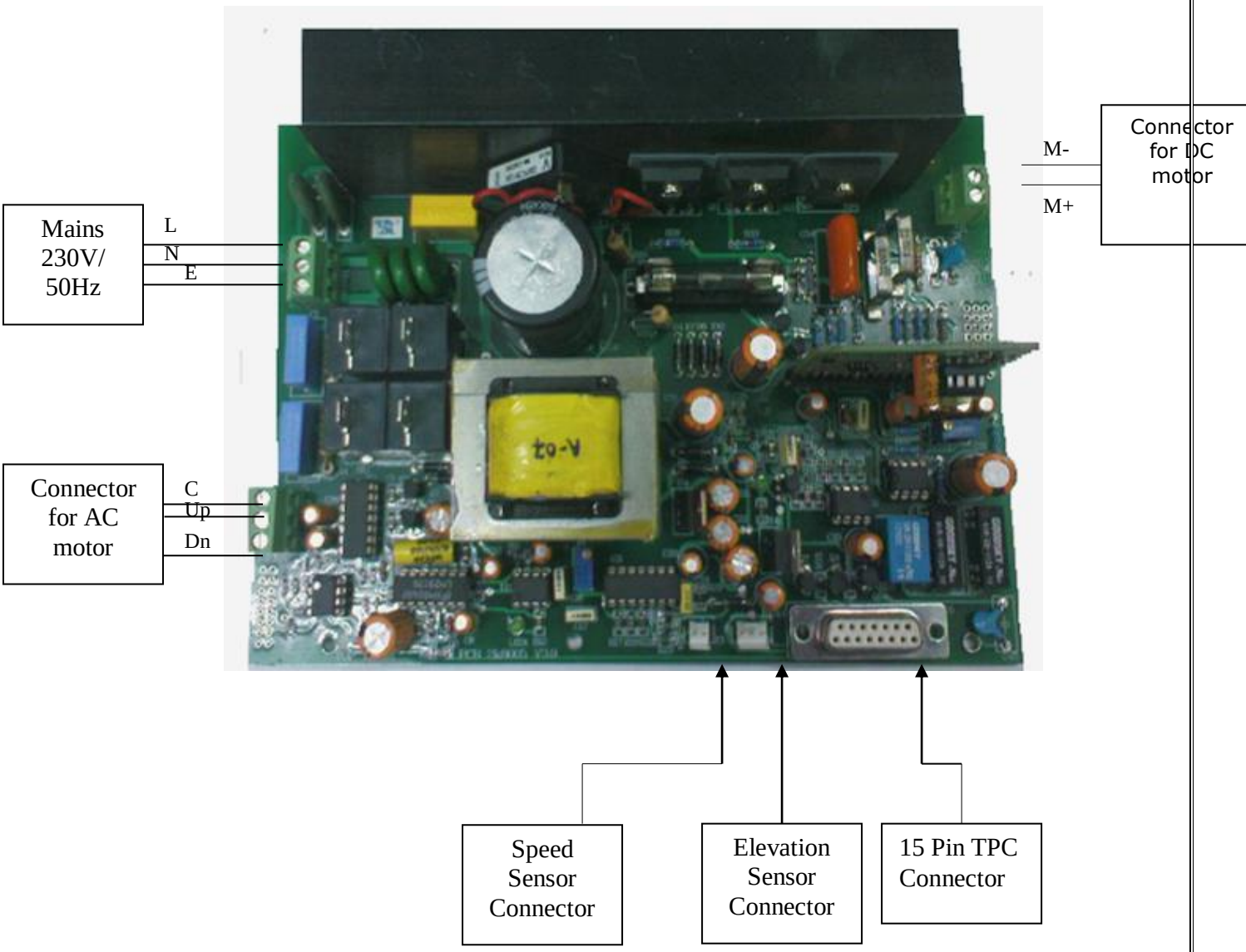


Fig 7. High frequency drive connections

Connection of limit switch if high frequency drive is to be used in Treadstar and Compact Machine: -

Note: - we can not use high frequency drive in compact machine which has Thyron DC Motor.

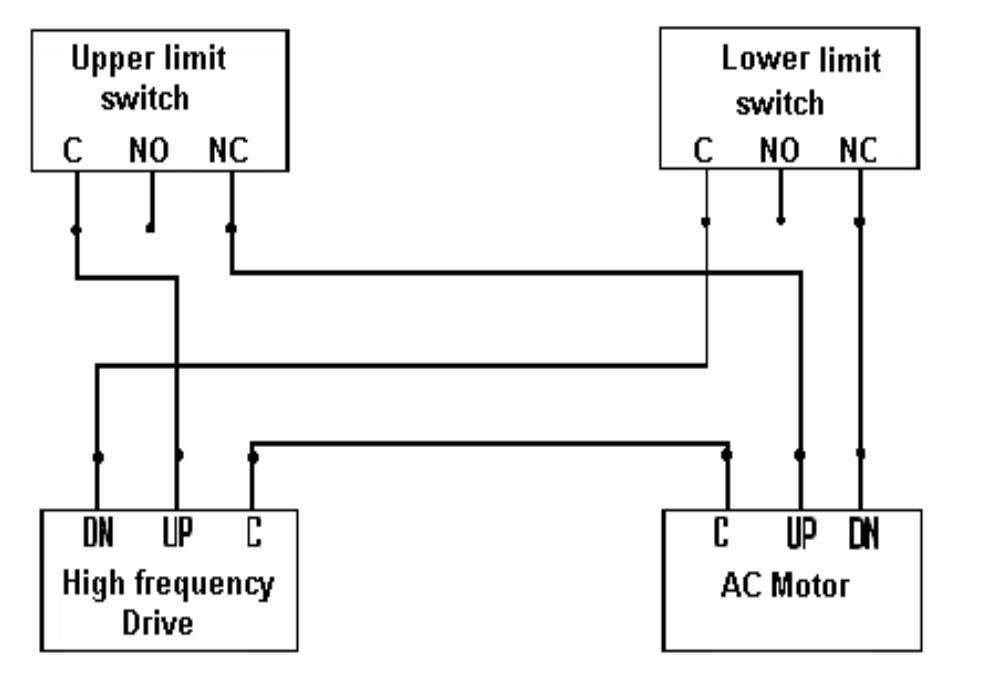


Fig 8. Limit switch connections for compact machine.

NOTE: -

- **Testing of limit switch: -**

  1) First check that there is continuity between **C** (common) terminals of limit switch with **NC** (normally closed) terminal of limit switch. And there is no continuity in between **C** and **NO** (normally open) and **NC** and **NO.**

  2) Sometime there is continuity between **C** and **NO** and **C** and **NC** are open in few limits switch due to wrong marking on them then in that case use **NO** Terminal as **NC** and do all connection to **NO** terminal instead of **NC**.

2. Problem solutions and material required to attend the call.

SPEED RELATED				
	Problem	**Check Points**	**Corrective Action**	**MATERIAL REQD. TO ATTEND CALL**
1	**Speed reduces in second stage and onwards**	1. Check distance between Flywheel of DC Motor and Speed Sensor is in between 5mm to 7mm.	If not, place it at correct position.	Sensor coil. High Frequency Drive.
		2. Check calibration factor in S/W, if it is correct, Calibrate the Treadmill for speed and elevation and then check if problem is solved on recalibration. If not follow below points.	If Calibration factor is not correct, then correct it from factor written on treadmill and then calibrate the Treadmill.	
		2. Check LED1 on High frequency drive flashes each time when the flywheel completes one cycle.	If not, check whether sensor connection is loose, if yes, correct it	
			Interchange sensor connections wires from 2 pin relimate connector.	
			If problem, persist change Treadmill controller.	
			If still problem persists, change High frequency drive.	
2	**No Speed (Conveyor belt is not moving at all)**	1. Run test Treadmill program from S/W under utilities menu and click on appropriate buttons for speed increase and decrease and check the speed increase/ decrease LEDs on front panel of the Treadmill Controller (Refer fig 2) flashes.	If LEDs are not flashing, then the problem lies in Treadmill Controller or calibration factor is incorrect. If possible, check with another Treadmill Controller. If LEDs are glowing now, then change Treadmill Controller.	High Frequency Drive, Treadmill controller, TPC cable, DC Motor
		2) Check if TPC cable is OK by checking its continuity.	If not cut both ends and resolder the cable (**Refer cable dig.1 for Cable Details**).	
		3) Still belt is not moving while testing the Treadmill independently then the problem probably lies on the Treadmill side. First remove top cover from Treadmill and check whether the mains	If it is not glowing, then ensure that 230-volt AC is reaching at mains connector on High Frequency Drive, if 230 volt is present, still LED is not glowing then change High Frequency Drive.	

		indication LED2 is glowing on High frequency drive.	If LED is glowing, still belt is not moving then change high frequency drive	
		4) The last step is to change the DC motor. But before changing do the following cold test. **Cold test for DC motor:** **a.** Remove 3-pin top of Treadmill from mains supply. **b**. Remove all the two wires of DC motor **c**. Ensure that there is no continuity between Treadmill body and all the connectors of DC motor. **d.** In case of pmdc motor, ensure that the armature resistance is nearly equal to 2-3 ohms.		
3	**Speed and elevation not as per protocol through software.**	Check calibration factor in S/W, if it is correct Calibrate the Treadmill for speed and elevation and then check if problem is solved on recalibration. If not follow below points.	If Calibration factor is not correct, then correct it.	Treadmill controller, silicon oil.
		Confirm that Treadmill and PC, both are connected to one and the same phase only. Always give power from one and the same extension board to Treadmill and ensure that Earth voltage is less than 5V.	If not connect both treadmill and PC to same phase.	
		Confirm that earth point of PC and Treadmill is shorted with 24/36 wire externally.	If not, short both earth points with 24/36 wire externally.	
		Check continuity of TPC and serial port cable. Setting and speed sensor alignment.	If needed re-solder the same **(Refer cable dig.1 for Cable Details).**	
		Check if and speed sensor alignment is OK.	If not place it correctly.	
		Also, if conveyor belt is too tight then this problem occurs**.**	In that case loosen the belt accordingly and put silicon oil under the belt.	
4	**Speed goes on increasing when we switch on the Treadmill. (Uncontrolled speed)**	Check sensor connector is properly connected. Ensure that it is not loose.	If not connect it properly.	Sensor coil, High frequency drive.
		Check continuity of TPC cable between High frequency drive and Treadmill controller.	if needed re-solder the same	

		Remove the speed sensor wires & ensure that resistance of speed sensor is nearly equal to 14 ohms.	If not Change speed Sensor	
		Ensure that the LED1 on High frequency drive is blinking.	If not, then change high frequency drive.	
5	**Jerk in speed/Speed reduces as patient walks on Treadmill.**	Check if silicon oil is added below conveyor belt.	If not add silicon oil below conveyor belt from both sides.	Silicon oil, sensor coil, High frequency drive.
		Check if Conveyor belt is not loose.	If yes correct it.	
		Check if High frequency drive can provide sufficient current to DC motor. For it Adjust resistance equal to 3.5K across P4 of J6 with respect to shunt by adjusting pot P3.	If not run test Treadmill option from software under utilities and increase the speed up to 10 km/hr in steps of 1 km/hr, ask a person to walk on Treadmill. Here the actual speed is reducing; adjust compensation trim pot (P3) slightly so that sufficient current is supplied to DC motor.	
			If still problem persists then change High frequency drive.	
6	**Elevation is correct but speed incorrect in protocol**	Check if Treadmill and Treadmill controller is connected on one and the same phase. Measure (1) Earth to neutral voltage, (2). Earth to line voltage, for treadmill, PC and Treadmill controller by removing the 3-pin power cord, it should be nearly equal if all is connected on same phase.	If not, connect them on same phase.	Sensor coil, TPC cable, Treadmill controller.
		Check if Treadmill connected on UPS supply. (It should be on stabilizer)	If not connect it on UPS with stabilizer.	
		Check if all three equipments are connected on one and the same earthing.	If not connect all equipment on same earthing.	
		Also Refer point3 and 4.		

ELEVATION RELATED.				
1	**No Elevation**	Run test Treadmill program and click appropriate buttons for Elevation increase and decrease and check if the LEDs on the Front panel of Treadmill controller are glowing.	If the LEDs are not glowing, then the problem lies with Treadmill controller, or the calibration factors might be wrong. Check with new Treadmill controller	Treadmill controller, High frequency drive. Actuator.
		If problem persists then check treadmill independently i.e., short pin 1 & 7 of the 15-pin d type connector and check whether the Treadmill is elevating or not.	If on shorting treadmill is elevating, then problem is in Treadmill controller check with another one. But if it is not elevating on shorting then change high frequency drive	
		The last step is to change the Actuator.		
2	**Treadmill runs smoothly for first couple of stages, after that it elevates randomly.**	This occurs if 10K Pot of Actuator doesn't work properly.	If not adjust/change it properly.	10K pot, High frequency drive, Actuator
		If problem persists, check with another high frequency drive . The last step is to change the Actuator.		
3	**Treadmill is stuck /elevates to its top position**	Check Treadmill manually from 15 pin connector on high frequency drive i.e. Short pin 1 & 7 of the 15-pin d type connector and check whether the Treadmill is elevating or not.	If working, OK but if it is not working then remove Actuator's connections from high frequency drive and put in extension board to check Actuator. **Connections:** Grey + Black→DOWN Grey + Red→UP **Warning:** Do not put red and black simultaneously it will physically burn the Actuator	High frequency drive, Actuator, treadmill controller.
		If still problem persists then problem is in Treadmill controller	Change the Treadmill controller. Recalibrate the Treadmill check the	

			Treadmill through test Treadmill option. If still problem persists, isolate the Treadmill from PC and test the same Independently for elevation (Refer STWin service manual Procedure 1, page-26**)	
4	**No medians and no heart rate.**	Check If amplitude of R wave is not less than 0.4cm in QRS detection lead.	If it is less than 0.4 cm, then Change the QRS detection leads from menu option so that the Q detection lead is with tall R wave.	
			Amplify the QRS detection lead.	
			Increase the gain	
		After doing any one of above three options, wait till the heart rate settles to correct value. Once the heart rate settles, click relearn buttons 3 to 4 times so that the medians get updated correctly.		

MISCELLANEOUS

Problem 1.	Treadmill becomes non-functional again and again.
	Possible Cause: 6. No Servo make voltage stabilizer is used for Treadmill even though the supply voltage is fluctuating. 7. Voltage Stabilizer is not stabilizing the voltage. 8. Type of Stabilizer is other than Servo. 9. There might be leakage of current. 10. Problems due to slower configuration. **Solution:** 6. Use 3.5 KVA Servo Stabilizers for Treadmill. 7. Ensure that despite changes in supply voltage at mains, the output voltage is stable. For this, change the analog meter switch of stabilizer to INPUT mode, connect digital voltmeter (D.M.M.) to output of the stabilizer. Now you are observing input voltage to stabilizer and output voltage of the stabilizer. Here the out put voltage displayed on D.M.M. should not vary by more than 2-3 volts even though the input voltage changes by more than 10-20 volts. 8. If this output voltage to Treadmill is also varying with changes in supply voltage, the stabilizer needs to be repaired immediately. 9. There are different types of voltage stabilizers used for voltage stabilization. One is the On-OFF type of stabilizer. Here depending upon the input voltage range, the relay inside the stabilizer operates to stabilize the output voltage. But this relay operation generates a spike at the output. This spike creates a problem to DC motor speed control circuit and hence the Treadmill stops working. Another type of stabilizer is SERVO STABILIZER. This stabilizer has built-in servo-motor, which rotates continuously with change in supply voltage. The shaft of this motor selects the appropriate winding of the VARIAC to stabilize the output voltage at 230 volts. Hence there are no spikes in the output voltage of the stabilizer. 10. This SERVO type is recommended for Treadmill.

Problem 2.	Spike in ECG
Solution	Use branded SMPS for PC
Material Req.	Intex make SMPS

4. APPENDIX: -

a) CABLE DIAGRAMS: -

1. TPC CABLE DETAILS.

1. NC	**9. Speed Increase**
2. +5 VDC	**10. Speed Decrease**
3. NC	**11. NC**
4. Ground	**12. NC**
5. Speed Feedback	**13. NC**
6. Grade Feedback	**14. NC**
7. Grade increase	**15. NC**
8. Grade Decrease	

15 Pin D type (M) conn.	15 Pin D Type (F) conn.	Color
02	02	Black
04	04	Brown
05	05	Red
06	06	Orange
07	07	Yellow
08	08	Green
09	09	Blue
10	10	Violet
11	11	Gray

****Short Shield to pin no 4 of (F) conn.**

Note: - if TPC cable of STWin amplifier is to be used with high frequency drive then make one extra connection of pin 2 as shown above.

2. TREADMILL CONTROLLER TO SERIAL PORT CABLE DETAILS.

09 Pin D type (M) conn pin no.	09 Pin D type (F) conn pin no.	Color code
02	02	Black
03	03	Brown
05	05	Red
Shield open and cut	Short Shield to pin no 5 of (F) conn.	

3. TREADMILL CONTROLLER TO BODY LEVEL CABLE DETAILS.

09 Pin D type (M) conn pin no.	09 Pin D type (M) conn pin no.	Color code
02	02	Black
03	03	Brown
05shorted to 09	05shorted to 09+Shield	Red
07	07	Orange
08	08	Yellow

b) ASSEMBLING AND DISASSEMBLING OF TREADMILL PARTS:

Precaution: While removing any treadmill part first check how it is connected to it i.e., its correct position w.r.t some fixed part of treadmill so that there will be no problem on mounting it back to treadmill.

1) Fitting front and side handle to Treadmill: -

- **For front handle**

  a) First place front handle in its appropriate position matching with slot of Treadmill on both side and then fix it with four M10X25mm Allen bolt at four drill of Treadmill two on both sides as shown in fig 9.

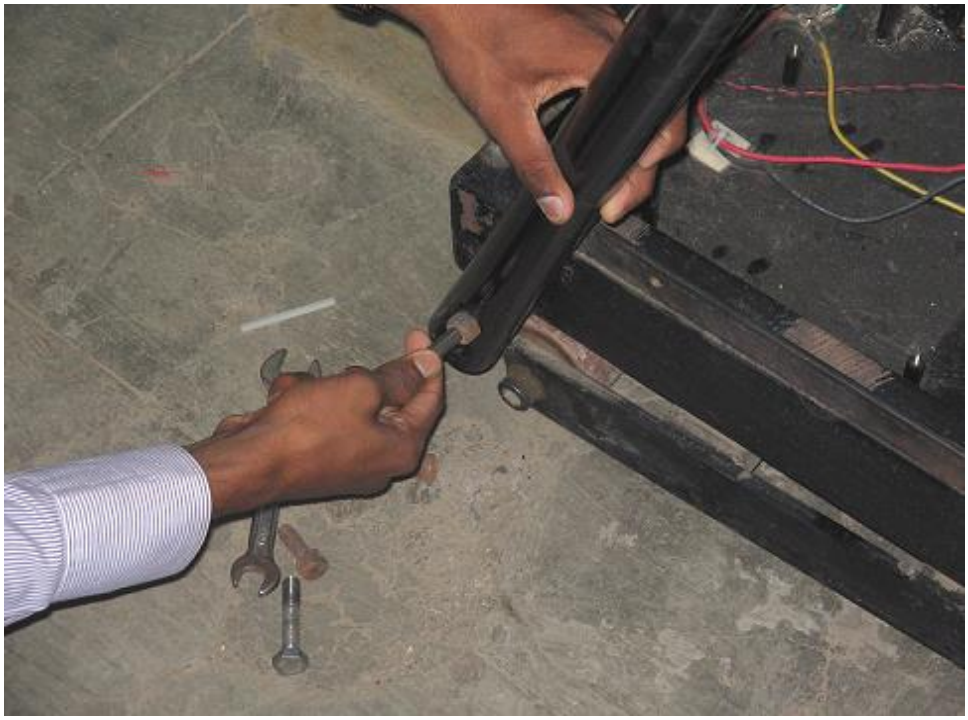


Fig.9

- **For Side handle**

    a. First keep side handle facing one end to front handle and other end to bottom slot of treadmill as shown in fig. And then fix its one end facing front handle with M10X25mm Allen bolt and other end facing bottom drill of Treadmill with M10X10mm bolt and M10nut as shown in fig10.
    b. Similarly connect second side handle to other side of treadmill.

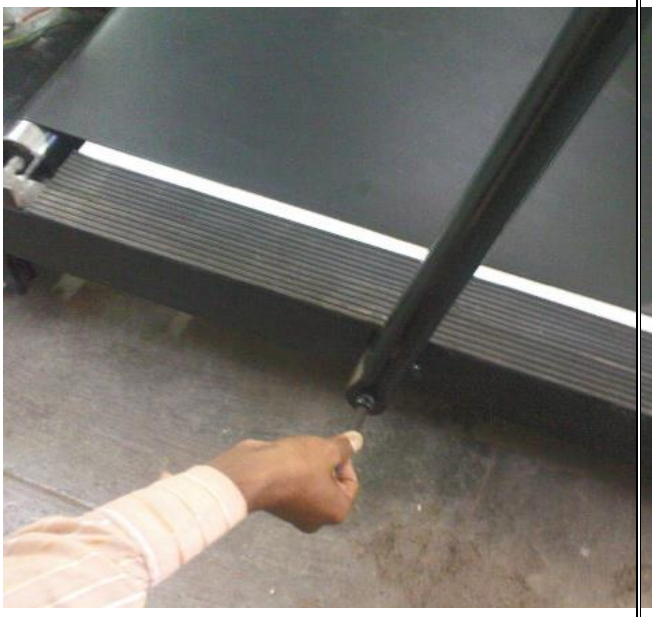


Fig.10

2) Removing back and front roller from Treadmill: -

For bottom Roller:
a) First remove two end caps of treadmill as shown below.

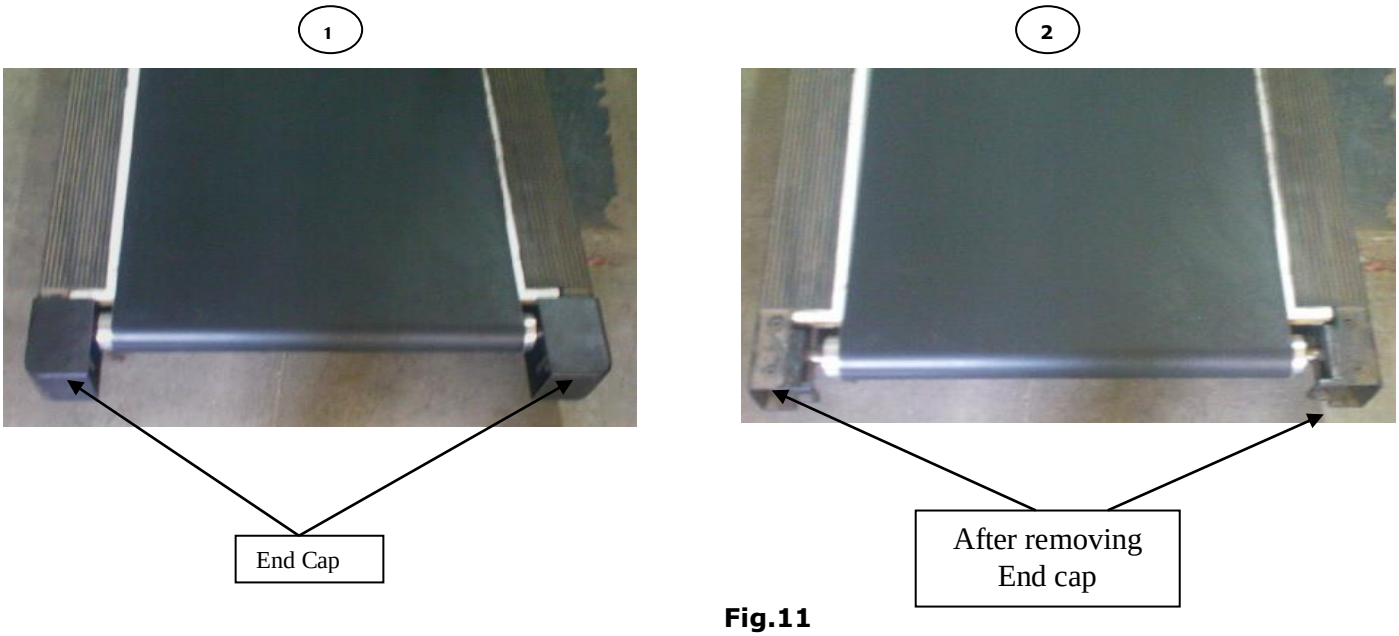


Fig.11

b) Remove two side handles by removing Nut bolt arrangement used in fitting side handle as described in point 1 under heading "**Fitting front and side handle to Treadmill".**
c) Remove top cover of treadmill by removing seven M6X16mm button head Allen bolt as shown in fig.12.

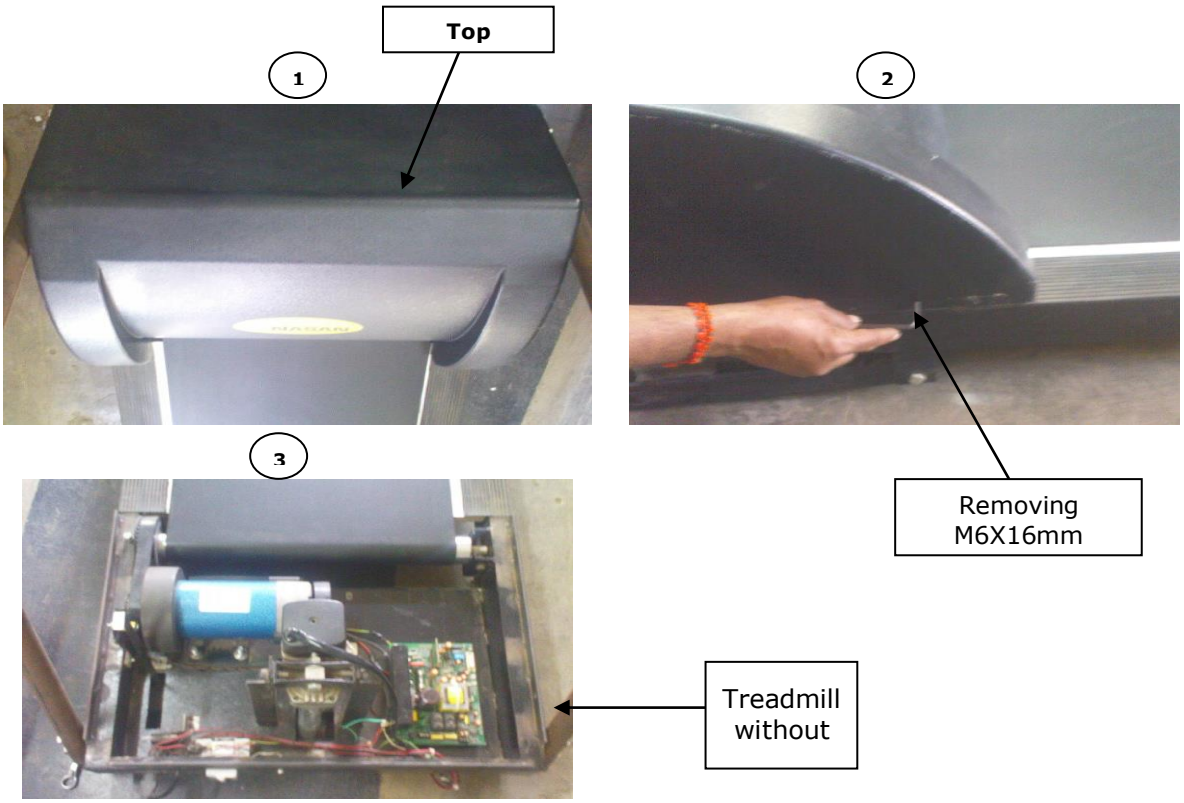


Fig.12.Treadmill after removing top cover

d) Loose two M10X70mm Allen bolt of bottom roller as shown in fig.13.

Fig. 13

e) Remove six M10X30mm Allen CSK bolt from wooden board as shown in fig.14.

Fig. 14

f) Remove two M10X70mm Allen bolt of bottom roller as shown in fig.13 (2).

g) Now remove bottom roller from treadmill.

Fig.15. Treadmill after removing the back roller

- **For removing front roller: -**

h) First remove wooden board from treadmill as shown in fig.16 (1)

Precaution: On back side of wooden board there are two rod to hold the conveyor belt to its correct position as shown in fig. 16(2). While removing wooden board hold it properly as its back side rod can damage conveyor belt which is in between these two rods

i) Then remove M10X100mm full thread Allen bolt by removing M10 nut attached with it as shown in fig.16 (3)

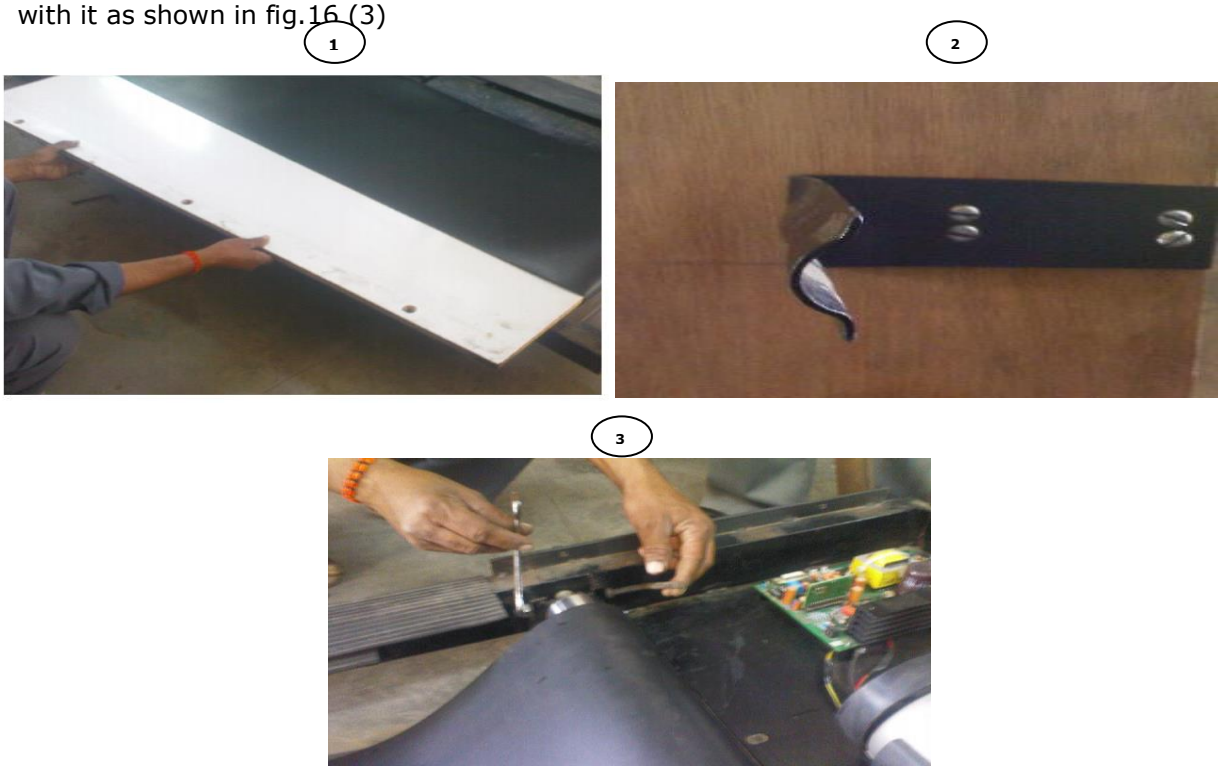


Fig.16

j) Remove M8X30mm fixed bolt which is on another end of roller as shown in fig.17.

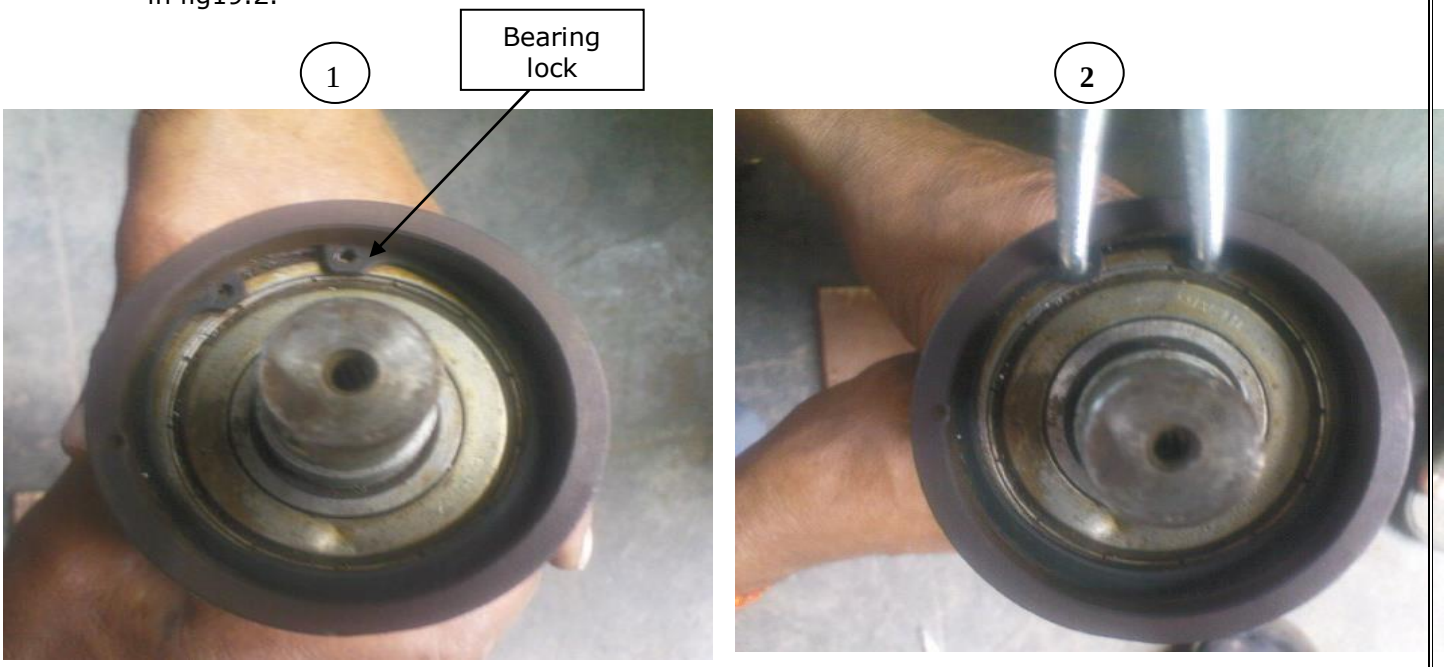
Fig.17

k) Now remove front roller as shown in fig. 18.

Fig.18. Treadmill after removing front roller

3) Removing Bearing of front and back roller.

a) First remove Bearing lock from both side of roller with aid of inner Pliers as shown in fig19.2.



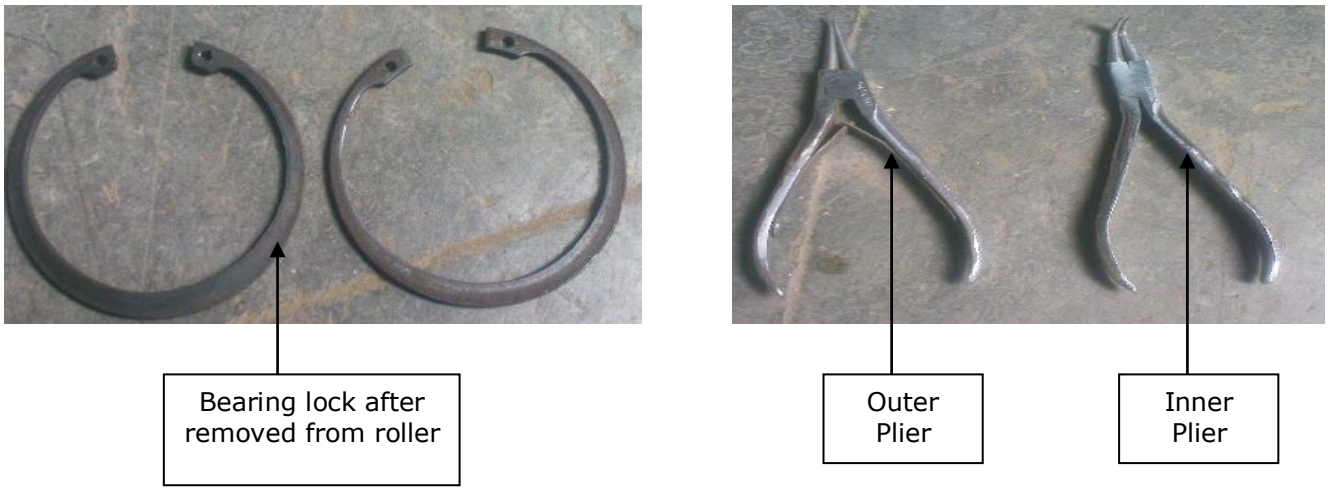
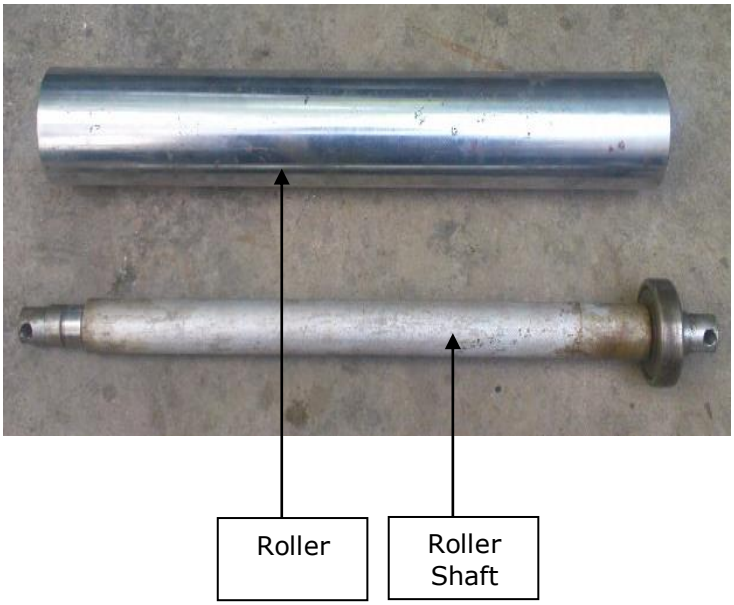


Fig.19

b) Then Press Shaft other end so that bearing will come out from it as shown in fig.20.1 and then remove Bearing from it as shown in fig20.3.

1

2



3

Fig.20: - Removing Bearing from Roller.

Note: -Follow same step for removing all four bearing from roller.

4) Removing actuator from Treadmill: -

a) First place one support like stool below treadmill as shown in fig.21 so that it will not fall directly after removing of actuator.

b) Then remove top M10X35mm Actuator mounting bolt by removing M10 nut as shown in below fig21**.**

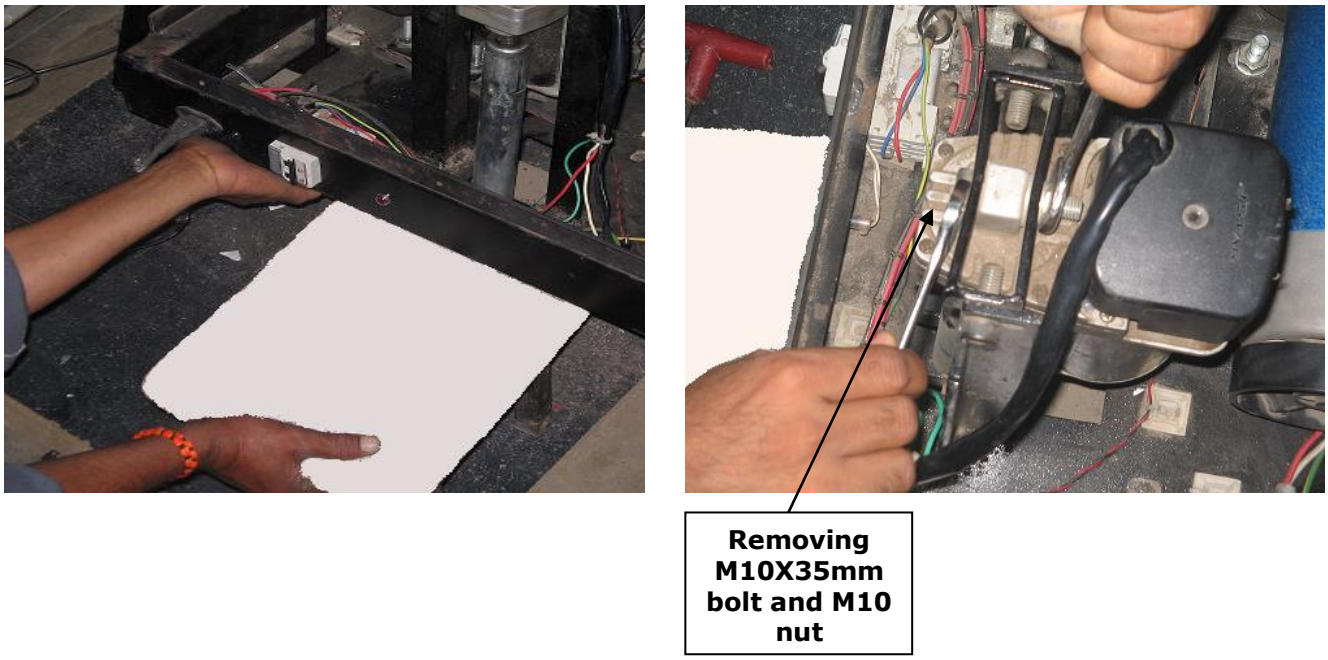


Fig. 21

c) Remove M10X70mm Actuator pipe mounting Allen bolt by removing M10 nut from it as shown in fig.22.

Fig. 22

d) Now remove actuator wiring from high frequency drive, and then actuator can be easily removed from treadmill.

NOTE: - For Upper and lower limit switch setting Procedure see Procedure 6. "Changing of Actuator" on page 32 to 34.

5) Removing DC Motor from Treadmill: -

a) First elevate treadmill to its middle position with aid of actuator.
b) Remove DC motor connection from High frequency drive.
Warning: - Do not disturb two bolt of DC motor adjuster (M10X30mm hex bolt).

c) Remove DC motor fly wheel retainer plate by removing M12 hex bolt as shown in fig 23.

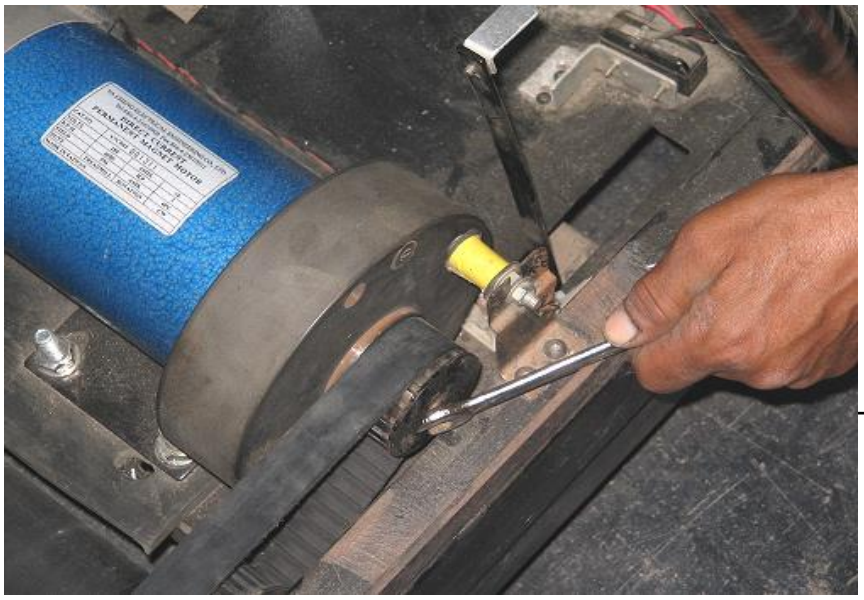


Fig23

d) After removing fly wheel retainer plate remove timer belt which is attached to the plate.
e) Now remove four M10X40 hex bolt plus plain spring by removing M10 nut attached with it as shown in fig.24 and then DC motor can be easily removed from treadmill.

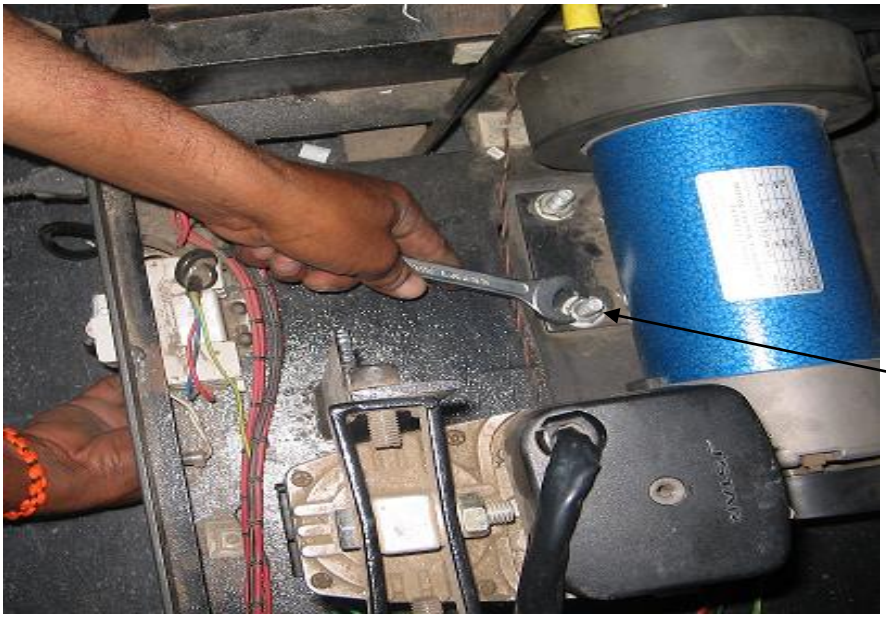


Fig.24

5) Removing conveyor and Timer belt from Treadmill: -

a) For removing conveyor and timer belt we must remove two front and back rollers from treadmill and then this belt can be easily removed from treadmill.

Note: - For removing two rollers, refer point 2 under heading removing back and front roller from Treadmill.

c) REPLACING AC-DC COMBINED CARD WITH HIGH FREQUENCY DRIVE: -

a) Main's connection:
Connect three wires from CON10 of AC-DC card directly to J1 (mains) of high frequency drive.
Ensure L, N, E of AC-DC card connect to L, N, E of high frequency drive**.**

b) E.S (CON12) and MCB (con13) connection: -
Leave these two connections as it is on treadmill.

C) AC Motor connection:
For doing AC motor connection first remove three wires from CON10 of AC-DC card and then connect common wire of it directly to terminal **C** (on connector J2) of high frequency drive.
For doing connection of UP. and DN. wire of CON11 refer fig.8 under heading **Connection of limit switch if high frequency drive is to be used in Treadstar and Compact Machine.**

d) Upper and lower limit switch (con15, con7) connection: -

Remove wire from these two connectors and do taping on them as we have already done limit switch connection according to fig.8 in step C (AC Motor connection).

e) DC motor connection: -

Remove two wire **A+, A-** from (con15) of AC-DC card and connect it directly to **M+, M-** (connector J7) of high frequency drive.
Do taping of remaining two wires of con15 **(F+, F-)** as we didn't use DC motor which is having field connection now.

f) 15 pin D type female connector connection: -

Connect 15 pin D type male connector from treadmill controller /STWIN amplifier directly to 15 pin D type female connector on treadmill.
Ensure that connection of cable between 15 pin D type male connector from high frequency drive to 15 pin D type female connector on treadmill is according to TPC cable detail as describe in Appendix above. **As we require pin no. 2 connection of 15 pin D type connector in case of high frequency drive which is not needed in AC-DC card.**

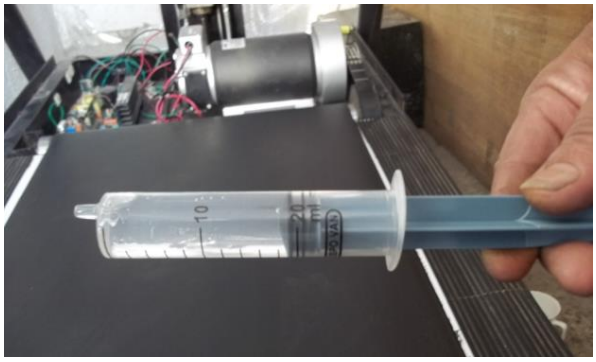
g) Sensor wire connection:

Connect two wires of Speed sensor from con8 of AC-DC card directly to J3 of high frequency drive.
Connect three wires of Elevation sensor from con6 of AC-DC card directly to J8 of high frequency drive.

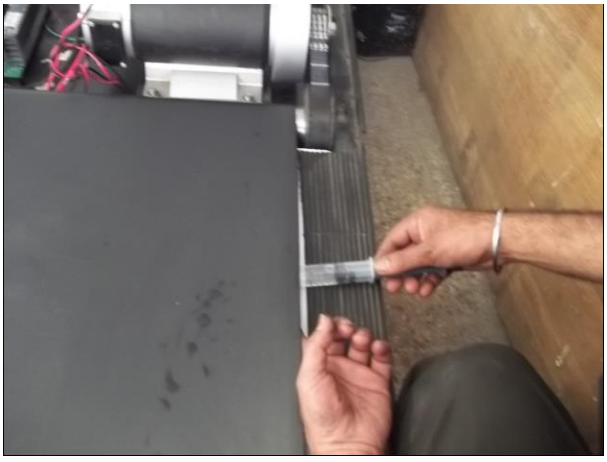
D. Silicon oil refilling

Silicon oil refilling is required after every 4 months to maintain smooth operation of treadmill belt. Follow the below steps to pour silicon oil below belt.

1. Take 20 ml silicon oil in insulation syringe



2. Pour all 20 ml blow front both sides.



3. Take again 20 ml of silicon oil in springy and pour all 20 ml below back both sides.

4. Take 20 ml of silicon oil and pour from bottom side evenly.