Service Manual.

Quinton®

SERIES 90™ TREADMILL

Service Manual and Schematics Package

For use with U.S. models only

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SECTION 1. INTRODUCTION

SCOPE

This manual contains the theory of operation, troubleshooting information, installation and maintenance procedures, and the drawing package for the Quinton® Series 90™ medical treadmills listed in Table 1-2 on page 1-3. It is intended for *Quinton-trained service personnel.*

NOTE

Do not use this Manual to service the following Q-Series™ treadmills:

—Q50 (Quinton p/n 00259 or 000306)
—Q55 (p/n 00208 or 00308)
—Q55XT (p/n 00264 or 00309)
—Q65 (p/n 00221 or 00307)

Refer to Quinton Service Manual p/n 000208-830 or 000343-830, as appropriate, for information and schematics for these treadmills..

The Manual is divided into five sections:

- Section 1 includes a product description, a list of accessories and options, the specifications, and the power requirements for the various treadmills.
- Section 2 is the installation instructions for the treadmills.
- Section 3 includes a detailed theory of operation for the electronic and mechanical components of the treadmills. This section is primarily intended for reference and training.
- Section 4 is the assembly/disassembly, adjustment, and calibration procedures.
- Section 5 is the troubleshooting and maintenance guide for the treadmills. It includes a number of tables that contain component and troubleshooting data.
- Section 6 is the drawing package. It includes the assembly drawings, parts lists, and schematics for the Series 90 treadmills.

DESCRIPTION

The Series 90 treadmills are available in a number of models, differing in platform length, belt speed range, and power requirements. The specifications and power options are described in Tables 1-1 and 1-2 on the following pages.

Each treadmill requires an external device called the *controller* for operation. Quinton controllers include:

- the Q3000, Q4000, Q4500, and Q5000 Stress Test Monitors.
- the 645 Programmable Treadmill Controller.
- the 640 Manual Treadmill Controller.

Refer to the appropriate Operator Manual to operate the treadmill with each device. (The Model 640 Controller Manual is included with each treadmill. Other manuals are included with each Monitor or Controller.)

To order the Operator or Service Manual for any controller, contact your Quinton representative, or call Quinton Customer Service toll-free at 1-800-426-0347.

ACCESSORIES AND OPTIONS

The following accessories are shipped with each treadmill:

- Handrail Assembly (Quinton part number 031569-002)
- Hand grip (p/n 013802-001)
- Operator Manual (p/n 000346-840)
- Service Manual (p/n 000346-830)

These additional accessories are available:

- Overhead Mask Support (013689-001)
- Side Handrail, Short (p/n 13690-001)
- Side Handrail, Long (p/n 013691-001)
- Handrail **OFF** Switch (p/n 013675-001)
- Catheter Arm Support (p/n 000043-002)

To order any item, or for more information on any of Quinton's line of medical and fitness products, contact your Quinton Sales Representative or call the Quinton Customer Service Department toll-free at 1-800-426-0347.

SPECIFICATIONS

Table 1-1 lists the performance specifications, physical characteristics, and environmental requirements for the Series 90 treadmills. Table 1-2 includes the single-phase power options for each treadmill.

Table 1-1. Series 90 Treadmill Specifications

	Q50	Q55	Q55XT	Q65
Performance				
Max. Rated Load (Bruce Protocol)	275 lb (125 kg)	350 lb. (159 kg)	400 lb (181 kg)	400 lb (181 kg)
Belt Speed Range (Continuously Adjustable)*	0.8 - 8 mph (1.3 - 13 km/h) 0.6 - 6 mph (0.96 - 9.6 km/h)	1 - 10 mph (1.6 - 16 km/h)	1.5 - 15 mph (2.4 - 24 km/h)	1.5 - 15 mph (2.4 - 24 km/h)
Grade Range	0 - 25% (0 - 14°)	0 - 25% (0 - 14°)	0 - 25% (0 - 14°)	0 - 25% (0 - 14°)
Physical				
Walking Area (Nominal)	20 x 50 in. (51 x 127 cm)	20 x 55 in. (51 x 140 cm)	20 x 55 in. (51 x 140 cm)	20 x 65 in. (51 x 165 cm)
Walking Belt Circumference	115 in. (292.1 cm)	125 in (317.5 cm)	125 in (317.5 cm)	145 in (368.3 cm)
Floor Space Required	30 x 75 in. (76 x 191 cm)	30 x 80 in. (76 x 203 cm)	30 x 80 in. (76 x 203 cm)	30 x 90 in. (76 x 228 cm)
Walking Surface Height	7.3 in. (18.5 cm)	7.3 in. (18.5 cm)	7.3 in. (18.5 cm)	7.3 in. (18.5 cm)
Handrail Height above Floor	47 in. (119 cm)	47 in. (119 cm)	47 in. (119 cm)	47 in. (119 cm)
Weight	410 lb. (186 kg)	430 lb. (195 kg)	430 lb. (195 kg)	460 lb. (209 kg)
Shipping Weight	560 lb. (254 kg)	580 lb. (263 kg)	580 lb. (263 kg)	610 lb. (277 kg)
Power Cord Length	10 feet (3 m)	10 feet (3 m)	10 feet (3 m)	10 feet (3 m)
Environmental				
Operating Temperature	60 - 95° F (15 - 35° C)	60 - 95° F (15 - 35° C)	60 - 95° F (15 - 35° C)	60 - 95° F (15 - 35° C)
Storage Temperature	0 - 120° F (-18 - 49° C)	0 - 120° F (-18 - 49° C)	0 - 120° F (-18 - 49° C)	0 - 120° F (-18 - 49° C)
Humidity (Non-condensing)	30 - 90%	30 - 90%	30 - 90%	30 - 90%

*Typical—Other speed ranges are available.

Table 1-2. Power Options and Requirements

Model	Part Number	Voltage (VAC)	Frequency (Hz)	Full-load Current (Amps)	Branch Circuit Amperage (Minimum)
Q50	345-001 & 345-010	115	60	12	15
	345-002 & 345-011	208/230	60	6	15
	345-003	100	60	12	15
	345-004	100	50	12	15
	345-005 through -009 and -012 through -016	230	50	6	10
Q55	346-001	208/230	60	12	15
	346-002	115	60	24	30
	346-003	100	60	24	30
	346-004	100	50	24	30
	346-005 through -009	230	50	12	13
Q55XT	343-001	208/230	60	16	20
	343-002	200	60	16	20
	343-003	200	50	16	20
	343-004 through -008	230	50	16	16
Q65	344-001	208/230	60	16	20
	344-002 & 344-004	200	60	16	20
	344-003 & 344-005	200	50	16	20
	344-006 through -010	230	50	16	16

SECTION 2 RECEIVING, UNPACKING, AND INSTALLATION

INTRODUCTION

This section contains instructions for receiving, unpacking, inspecting, and installing the Quinton Series 90 Treadmills.

RECEIVING

Before leaving the factory, the treadmill was thoroughly inspected and tested for proper operation. To minimize shipping damage, careful attention was given to packing, crating, or making the unit ready for padded-van shipment. Quinton's responsibility for the unit ends upon delivery to the carrier, who assumes responsibility for safe delivery. When loss or damage to equipment that is shipped FOB Factory is sustained in transit, all claims must be made by the customer and submitted to the carrier.

For shipments that are sent FOB Destination, Quinton Instrument Company will file the claim, provided that we are furnished with an acceptable inspection report from the carrier. If the claim is disallowed because the customer failed to obtain the report, repair charges will be billed to customer.

INSPECTION AND UNPACKING

WARNING

The treadmill requires two people to uncrate it, lift it, and move it into position.

The unpacking and removal instructions are inside the box. Please read them after performing Step 2 below, but before removing the treadmill. Otherwise, you can damage the treadmill. For your convenience, they are reprinted below.

Also, note that the operator and service manuals and the front handrail assembly are standard items, although they are not listed on the waybill.

1. Inspect the shipping container for evidence of damage. Damage should be noted on the waybill, which should be signed by the carrier's agent. Failure to describe external evidence of loss or damage on the waybill can result in the carrier refusing to honor the claim.
2. Use a razor knife to cut the straps that secure the treadmill cover to the pallet, then remove the cover.
3. Remove the empty filler box and discard.
4. Use a razor knife to cut the straps that secure the handrail to the treadmill.
5. Remove and discard the plastic bag that encloses the treadmill.
6. Loosen the two hex bolts at the rear of the pallet, then remove and discard the bolts, washers, and rear frame. See Figure 2-1 (page 2-2).
7. Remove the two hex bolts at the center of the pallet.

CAUTION

Do not remove the bolts at the front of the pallet.

8. Remove the 2 x 4 wood blocking at the rear of the pallet, between the platform and the skid (Figure 2-1). Save the block.
9. Use the wood block removed in Step 8 to pry up the rear of the platform, then lift the treadmill and the platform.
10. Pivot the pallet skids from the rear of the pallet to the left and to the right, then allow the pallet platform to lower to the floor. See Figure 2-1.
11. With help from another person, lift the rear of the treadmill and slowly roll it backwards off the pallet.
12. Roll the treadmill to its final location and set it down.

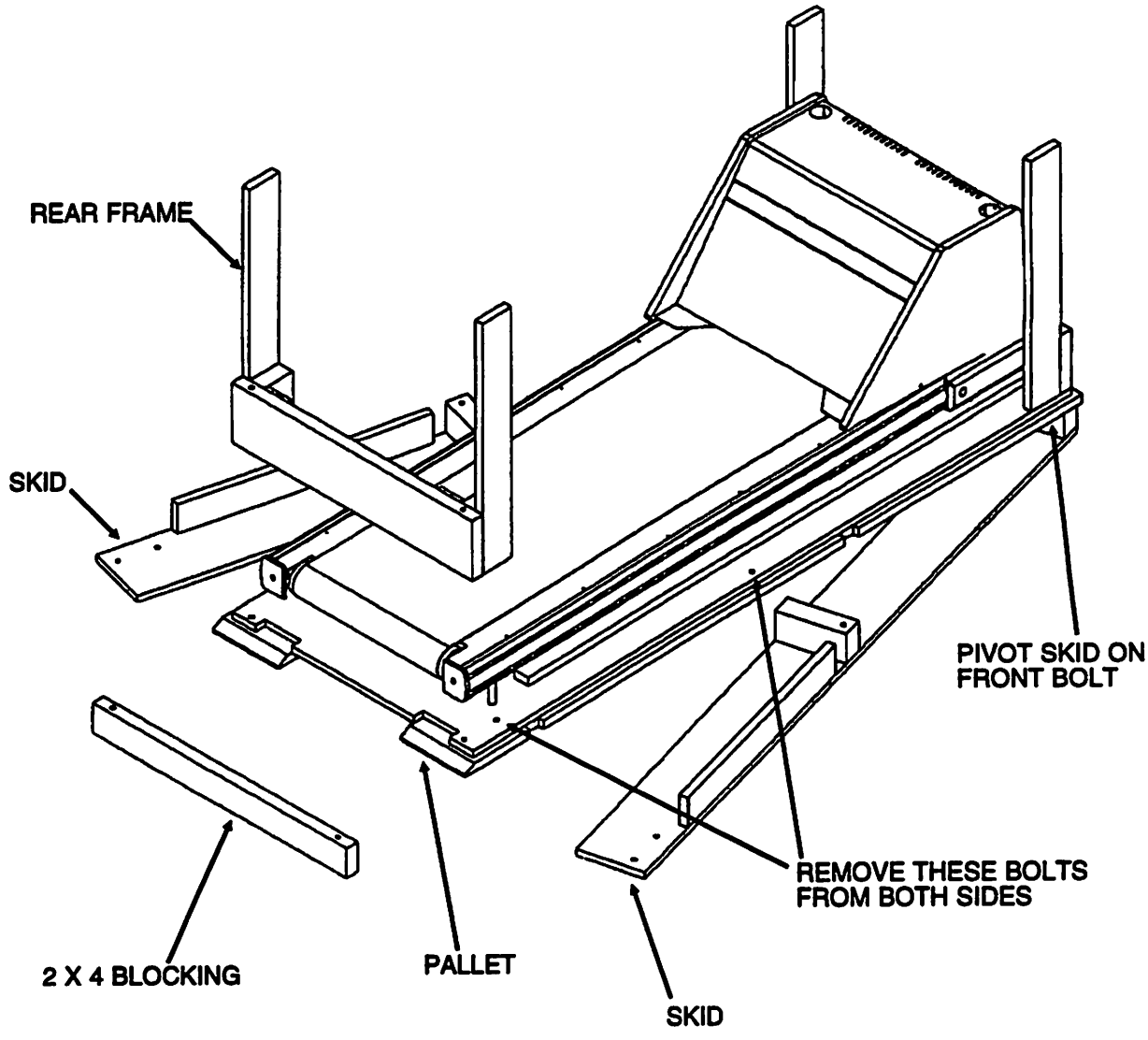


Figure 2-1. Unpacking the Treadmill

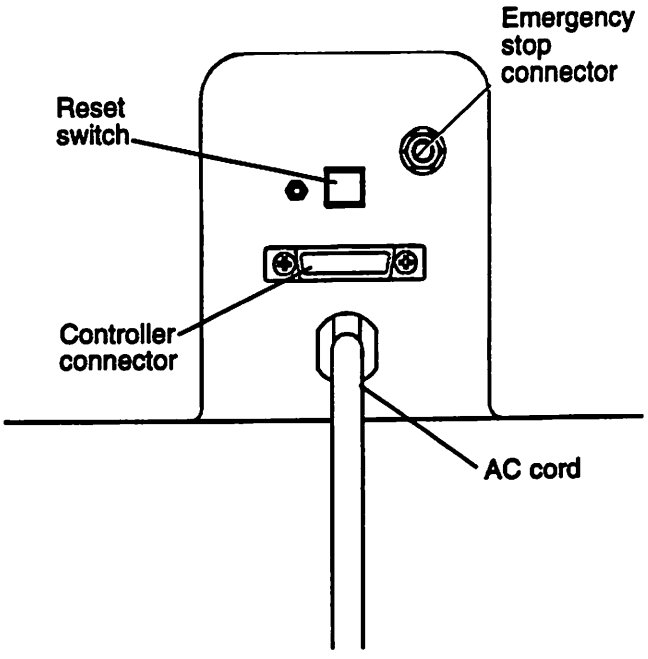


Figure 2-2. Reset switch and connectors

INSTALLATION CHECKOUT PROCEDURE

Use this procedure to verify proper operation.

1. Verify that the service outlet voltage matches the voltage on the nameplate.

CAUTIONS

Do not use an autotransformer to increase 115 VAC to 230 VAC to run the treadmill. Consult a licensed electrician to correct the voltage at your facility.

If you are using a Stress Test Monitor as a controller, verify that the monitor and the treadmill are each on a separate branch circuit.

2. Plug the treadmill power cord into the wall outlet.

WARNINGS

- ***Excessive risk current (leakage) may result if this equipment is connected to other than a single phase grounded center tap supply.***
- ***Do not start the walking belt or press the RESET switch when someone is on the treadmill. The belt starts moving immediately, and the sudden start and subsequent loss of balance could cause serious personal injury.***

3. Inspect the controller connector for damage. It is located near the power cord (Figure 2-2). If it is not damaged, connect the control cable to the treadmill.
4. Connect the control cable to the controller.
5. Ensure that nobody is on the treadmill walking belt, then press the red treadmill RESET Switch above the treadmill connector (Figure 2-2). The belt should start momentarily, then stop automatically.
6. Perform the treadmill checkout procedure described in the Operator Manual for your controller.
7. Perform the following checks on the Model 640 controller (if applicable):
   a. Verify that the **DISCONNECTED CABLE** LED is off.
   b. Press **POWER** to turn the controller on.
   c. Press **START BELT** to start the treadmill.
   d. Use the **SPEED INCREASE** and **SPEED DECREASE** pushbuttons to verify proper operation throughout the treadmill's complete speed range:
   - Q50: 0.8-8 mph (1.3-13 km/h)
   - Q55: 1-10 mph (1.6-16 km/h)
   - Q55XT, Q65: 1.5-15 mph (2.4-24 km/h)

   e. Use the **GRADE INCREASE** and **GRADE DECREASE** pushbuttons to verify proper operation throughout its grade range of 0 to 25% (0-14°).
   f. Return treadmill to 0° elevation (horizontal).
   g. Press **STOP BELT** and verify that the treadmill stops.

SECTION 3 THEORY OF OPERATION

INTRODUCTION

This Section, which is primarily intended for reference and advanced training, describes the mechanical and electronic theory of operation of the treadmills. It is divided into three subsections:

- an overview of treadmill operation.
- the mechanical theory of operation, including the motors, gearing, etc.
- the electronic theory of operation, including a functional description of the PCB Assembly and the power supply.

OPERATIONAL OVERVIEW

The Series 90 treadmills include the:

1. Q50 treadmill, with a 50-inch walking platform.
2. Q55 treadmill, with a 55-inch platform.
3. Q55XT treadmill, with a 55-inch platform and a higher maximum speed than the Q55.
4. Q65 treadmill, with a 65-inch walking platform and the same speed range as the Q55XT.

The treadmills are functionally and operationally identical, and employ identical cable interfaces to the various controllers such as the 640 or the Q4500.

The Series 90 treadmills include the following primary assemblies:

- Three motors:
  - drive motor, which drives the walking belt.
  - speed change motor, which changes the belt speed.
  - grade motor, which changes the treadmill grade.
- input and output shafts, belts, and pulleys, which transfer mechanical energy from the motors to operate the walking belt and change the grade.
- speed change motor assembly (2A2).
- tachometer assembly (2A3).
- pinion shaft and rack gears.
- grade potentiometer (2R1).
- drive motor relay, or contactor (K1).
- treadmill control PCB assembly (2A1), which includes all the controlling electronics and the power supply.

A complete set of schematic diagrams and assembly drawings are included at the end of this Manual. A list of drawings appears on Page 6-1.

MECHANICAL THEORY OF OPERATION

Motors

All treadmill motors are continuous duty, single phase with internal overload protection. Drawing 031474, which shows the treadmill with the hood removed, illustrates the layout of the operational components described below.

Drive Motor

The drive motor provides the force to turn the treadmill drive pulley and move the walking belt. An arrangement of shafts, belts, and pulleys allows a movable sheave on the input shaft to change the output shaft's rate of rotation, which varies the speed of the walking belt.

Speed Change Motor Assembly

The speed change motor assembly consists of a reversible, variable speed DC gear motor, linked by a chain and sprockets to the speed change spindle assembly. The motor moves the speed change spindle assembly and movable sheave laterally along the input shaft to change the speed of the walking belt. A tachometer linked to the output shaft monitors the speed of the walking belt.

The speed change motor cannot be operated unless the drive motor is on.

Grade Motor

The grade motor is a right angle gear motor. The motor shaft is linked to a pinion shaft by a chain and sprockets. The chain turns a sprocket on the pinion shaft to raise and lower the headframe of the treadmill on two parallel rack gears. A grade potentiometer linked to the pinion shaft by a chain and sprockets monitors elevation.

Shafts, Belts, and Pulleys

An input shaft, an output shaft, belts, and pulleys function as a transmission for the treadmill.

Input Shaft

The input shaft includes a machined pulley, the fixed and movable sheaves that comprise the input pulley, and the speed change spindle assembly. A V-belt links the drive motor output shaft with the input shaft, which turns at a constant speed.

The speed change spindle assembly consists of a fork, a speed change spindle, and a yoke. As the speed change motor turns the spindle, the fork moves laterally on the input shaft, controlling the movable sheave. The speed change spindle assembly positions the movable sheave on the input shaft.

Output Shaft

The output shaft includes a spring, the movable and fixed sheaves that comprise the output pulley, and a timing pulley. The output shaft turns at a variable speed that depends on the pitch diameter of the output pulley.

Variable Speed Belt

A variable speed belt links the input pulley and the output pulley. The four sheaves are angled, so the variable-speed belt is forced in or out between pairs of sheaves, and therefore increases or decreases pitch diameter.

Spring tension against the movable sheave on the output shaft forces the belt outward, increasing the pitch diameter of the output pulley. When the speed change fork moves the movable sheave on the input shaft inward, the pitch diameter of the input pulley increases, causing a simultaneous decrease in the pitch diameter of the output pulley.

Treadmill Drive and Idler Pulleys

The timing pulley on the output shaft drives the treadmill drive pulley. The drive pulley drives the walking belt and the treadmill idler pulley.

Pinion Shaft and Rack Gears

The pinion shaft and rack gears allow the entire headframe assembly to tilt for grade changes. The pinion shaft has machined teeth at both ends to move a parallel pair of rack gears up and down. Factory-set limits establish the 0-25% grade range. Mechanical stops at the top and bottom of the rack gears prevent upward and downward overtravel. The pinion shaft has a torque limiting device to prevent damage to the grade motor if it continues to turn at the upper or lower limits of travel.

ELECTRONIC THEORY OF OPERATION

The treadmill electronics is included on the treadmill control PCB assembly, which is located under the treadmill hood.

The following paragraphs detail the circuitry and operation of the functional components on the PCB Assembly, including:

- power supply.
- power-up detect.
- start belt.
- speed feedback.
- speed limits.
- speed control.
- stop belt.
- **EMERGENCY OFF** switch.
- drive motor fault.
- slow-speed threshold.
- **RESET** switch/high-speed deceleration.
- grade change.
- grade feedback.

This description references schematic drawing 030626-201, located in the drawing package following Section 6 at the end of this Manual. In general, the first paragraph is a functional

description of the component, while the following paragraphs provide a detailed circuit-level discussion.

NOTE

When components and pinouts are specified, the component type and number are given first, followed by a hyphen and the pin number. If several pins are referenced, they are separated by commas. For example, "J1-3" refers to "Jack 1, pin 3", and "P7-4,13" refers to "Plug 7, pins 4 and 13."

Power Supply

The line voltage is stepped down to approximately 25 VAC by an external transformer. The 25 VAC is rectified and used to generate:

- +28 VDC for the speed-change motor.
- +23 VDC for relay coils.
- +12 V for analog signals and most logic, and
- +5 VDC for speed change-motor driver logic.

(Refer to dwg 030626-201, sheet 2.) Line voltage is sent to an off-board step-down transformer via an off-board terminal block. The transformer is configured so that approximately 25 VAC is returned to the PCBA on J1-2,4. CR3, C8 and C6 rectify and filter the AC voltage to provide the input for switching regulator U1. The switching frequency, approximately 100 KHz, is determined by R4 and C2. The input voltage is switched to the output at the switching frequency with a pulse width varied so that the feedback voltage (U1-10) stays at 5 V. For U1-10 to be at 5 V, R6 and R7 cause the output voltage (after filter L1/C9) to be at 28 V.

The 28 V provides the input for regulator VR1 (Sheet 1). The output of VR1 is such that a 1.25 V difference between pins 3 and 1. Disregarding the negligible current into pin 1, R2 and R3 cause the output to be approximately 23 V. This provides the input for the 12 V regulator VR2, which, in turn, provides the input voltage for the 5 V regulator VR6.

J1-2&4 is also rectified by CR1&2 (Sht 2) and filtered by R1 and C25. R29 is used to adjust this voltage so that a "low-line" condition causes the voltage at U6-11 to drop below +12 V. This causes U6-13 to go low, and R46/C30 ensure that once low, the signal stays low for at least one second. The low causes J11-21, LO-LINE/, to go low, sending the error indication to the controller.

Power-up Detect

(Refer to Sheet 5.) Since a loss of power during treadmill use could cause the walking belt to stop with the mechanical transmission set above the acceptable slow-speed threshold, the return of power is detected to prevent a subsequent user from starting the belt until a slow-speed setting of the transmission is verified.

When the +23 V buss increases in voltage by more than 12 V (as in a power-up condition) C36, R60, and R58 combine to set latch U14-10 high. This is the same condition which occurs when the belt is stopped due to an Emergency Off or a drive motor overload. (These conditions stop the belt without allowing for a HI SPEED DECEL.) The high from U14-10 goes to three places:

- to U8-13, forcing it to go high, which causes U11-10 to go high, holding U11 in reset.
- to U7-2 via CR33, thereby removing the base drive from Q3 and preventing the user from starting the belt.
- to the Reset Switch LED via U7-4 and U7-13.

The low at U7-13 is also sent to U5-9 via CR23 (see sheet 4). This inhibits any grade change command from the controller by shunting the signal across R23.

Start Belt

(Refer to Sheets 5 and 6.) Quinton treadmill controllers complete a current path from STOP (J11-1,18) , Sht 5, to START/STOP (J11-2), Sht 6, when START BELT on the controller is pressed. This current causes the off-board contactor to close, thereby sending power to the drive motor. The current path can be broken by Q3 on the circuit board if appropriate.

When the treadmill user presses START BELT, STOP, J11-1,18, is pulled low. This low pulls J10-4 (Sheet 6), CONTACTOR COIL, low, activating the drive motor relay. It also turns on Q1 through R11 and CR15. This sends +23 V through R13, CR18, and R14 to switch on Q2, which pulls J11-2, START/STOP, low. Controllers are configured so that when J11-2 is low J11-1,18 is pulled low. Thus, when J11-1,18 is pulled low by pressing START BELT, J11-2 must be pulled low through Q2 before the treadmill user releases the START BELT button to latch the drive motor contactor on. A key element of the Slow-Start circuit is that Q3 can disable the normal START BELT function by not allowing the low at J11-1,18 to pass to the contactor at J10-4 nor to Q1, which would otherwise complete the latch at Q2.

One other condition will start the belt: when flip-flop U11 (Sheet 5) is in the HI SPEED DECEL mode, or set. The high at U11-13 causes U7-14 to go low, which pulls the contactor low at J10-4. The high at U11-13 also goes to U7-2 through CR32, pulling U7-15 low. The low at U7-15 removes the base drive from Q3 via CR28 and R33 and it removes the base drive from Q2 via CR27, CR18 and R14. This disables the START BELT function of the controller.

Speed Feedback

(Refer to Sheet 2.) Rotation of the treadmill output shaft causes an optical interrupter to send pulses to the circuit board which have a frequency directly related to the speed of the walking belt. A frequency-to-voltage conversion provides a voltage which is inversely proportional to the speed. (ie. the voltage is at +12 V when the belt is stopped and decreases linearly toward 0 V as the treadmill belt speed increases.) This voltage is used to trigger the electronic speed limits (see next section) and to determine the rate of speed change during a SPEED INCREASE or SPEED DECREASE (see SPEED CONTROL section). This voltage is also converted to a current which is directly proportional to the treadmill belt speed (1mA = 1 MPH). This current is sent to the treadmill controller via J11-12.

Speed feedback is provided by pulses from an optical tachometer located on the output shaft assembly. R107 completes the current path for the optical tach LED. The output of the tach (J7-1) should swing between +12 V and ground when the belt is moving. These pulses are seen at the inverting input of comparator U18 after noise filter R96/C53. The reference on the non-inverting input is approximately 2/3 the peak pulse voltage, created by the R77/R78 split of U13-1.

CR43 prevents the reference voltage from dropping below approximately 2 V. Positive transitions at the output of U18 are converted to 0.3 ms pulses by R122/C60 and negative transitions are converted to 0.3 ms pulses by R118/C61. R116 and R117 scale the pulses which are then filtered by R123/C63 and R124/C62. R128, R129, Q5 and U20 convert the filtered pulses to a feedback current which is inversely proportional to the time between the pulses. R128 is used to calibrate the output current so that 1 mA corresponds to 1 MPH.

The peak tach voltage is held by CR42/R76/C52. U13 buffers this voltage to provide the tach reference described above. U18 compares this voltage to approximately 7 V, generated by R94/R95. 7 V was chosen to allow for the CR42 diode drop as well as the sagging of C52/R76 during the negative portion of the tach pulse. Before the belt is started R99 and C55 hold flip-flop U19 set (i.e. U19-13 is high). When the belt is started, this RC network allows the peak tach voltage to reach a stable state prior to enabling the error condition. If the peak tach voltage is not at an acceptable level (approximately +8 V) or degenerates to an unacceptable level during use, U18-13 goes high, clearing flip-flop U19, causing U19-13 to go low. This low is sent to the speed feedback circuit via CR50 after scaling by R125 and R126. This causes the treadmill controller (such as the 645) to be given feedback indicating a high rate of speed. This, in turn, causes the controller to drive the speed down until it realizes it cannot change the feedback. At this time the controller will go into a Speed-Control Error mode. When the treadmill belt is stopped by the user, the error condition is reset by the high on U19-8.

SPEED LIMITS

(Refer to Sheet 3.) The voltage generated from the tach pulse frequency-to-voltage conversion discussed in the preceding section is adjusted by R85 to provide a voltage which varies from approximately +10 V to +12 V as the treadmill belt speed varies from its maximum rated speed to 0 MPH (stopped). This voltage is compared to two reference voltages which create a speed window for the allowable speed range. Attempts to drive the treadmill speed outside this window cause the appropriate speed-change signal from the controller (SPEED INCREASE or SPEED DECREASE) to be ignored.

R85 is used to adjust the SPEED FEEDBACK so that the maximum rated speed of the treadmill provides a voltage at JP3-2 which is slightly less than the voltage at JP3-3 (10.1 V). R80 and R81 combine to create the limit reference voltage at JP3-3. R30 is used to adjust the lower limit voltage at JP3-1 so that it is slightly less than the voltage at JP3-2 when the treadmill is at the minimum rated speed. These two adjustments define the speed-range window.

When the voltage at JP3-2 falls below the voltage at JP3-1, the low-speed limit is reached. This causes U15-1 to go low, shorting out any SPEED DEC command across R48. Also, via U5 -1 & 2 and U4-5 & 12, it lights DS5 to indicate the low speed limit has been reached.

When the voltage at JP3-2 goes above the voltage at JP3-3, the high-speed limit is reached. This causes U15-7 to go low, shorting out any SPEED INC command across R42. Also, via U12 -5 & 6 and U7-1 & 16, it lights DS1 to indicate the high speed limit has been reached.

Note that when the belt is stopped U16-1 is at +12 V. Regardless of how R85 is set, the feedback of R68/R70 will not allow U16-7 to fall below approximately +5 V. Thus, for testing purposes the electronic low-speed-limit can be disabled by shorting JP3-1 to ground using switch SW1-1 & 8.

As noted above, R85 adjusts the speed feedback so that approximately 10.0 V is present at JP3-2 at the treadmill's maximum rated speed. This occurs when R85-2 is at approximately 10.0 V. Thus from 0 MPH to the treadmill's maximum rated speed, R85-2 varies from +12 V to +10 V. If the treadmill could attain four times its rated speed (it will be mechanically limited long before then) R85-2 would drop to +6 V. This would cause U16-7 to rise to approximately +20 V. Therefore, by pulling JP3-3 to +23 V using switch SW1-3 & 6, the electronic high-speed-limit does not function until the treadmill speed is over four times greater than the maximum speed setting of R85. Thus, if on a 1.5-15 MPH treadmill R85 was set so that the speed limited at 5 MPH, shorting JP3-3 to +23 V will allow the speed to increase to over 20 MPH.

NOTE

It would be necessary to set JP3-1 to +5 V using switch SW1-4 & 5 (Sheet 6) to provide adequate torque in the situation described above. It is important that switch SW1-4 & 5 are open for normal use.

CAUTION

The SW1 switches are intended for use solely during final calibration of the treadmill control board. Do not alter the post-calibration setting.

SPEED CONTROL

When a the controller PCBA receives a SPEED INCREASE or SPEED DECREASE command from a treadmill controller such as the Model 645, pulse-width modulated 28 V pulses drive an off-board DC motor, which turns to change the mechanical transmission appropriately to increase or decrease the treadmill belt speed.

(Refer to Sheet 3.) Speed control is obtained by varying the pulse width of the SPEED ENABLE signal. When SPEED ENABLE is high and either SPEED INC or SPEED DEC is high, 28 V is routed to the speed change motor. The current path for a SPEED INC is +28 V from U2-4 to U2-3, through K4 to the speed change motor via J5-3, back from the motor via J5-5, through K4 to U2-2, from U2-2 to U2-1, and through current-sense resistor R8 to ground. SPEED DEC is similar, with the signals at U2-2 and U2-3 reversed.

(Refer to Sheet 6.) The frequency of the SPEED ENABLE pulses are determined as follows: R50, R51, R52, CR31, and R49 combine to place approximately 10.17 V at U6-7 when U6-1 is high and 2.78 V at U6-7 when U6-1 is low. When U6-1 is high, R26 and R27 charge C24 from 2.78 V to 10.17 V exponentially. This takes approximately 163 µs. When U6-1 is low, CR25 and R45 discharge C24 from 10.17 V to 2.78 V in approximately 2.21 µs. Thus the output of U6-1 is high for 163 µs and pulses low for 2 µs; the input to U6-9 varies exponentially from 2.78 V to 10.17 V in 163 µs and drops back to 2.78 V in 2 µs.

With JP2-1 connected to +5 V by using switch SW1-4 & 5, speed feedback does not affect the circuit and R61 can be adjusted to provide the proper speed change motor torque (i.e. the duty cycle of the 6KHz SPEED ENABLE pulses). The highest torque requirement occurs when increasing the speed at the top of the speed range (e.g. 9.5-10.0 MPH on a 1-10 MPH treadmill). At this time the speed-change motor current will be at a maximum. A typical SPEED MOTOR CURRENT value at this time will be 0.2 V; the motor's rated current would produce a voltage of 0.2856 V. Suppose R61 is set at 50.0 KΩ. At full-load current, this causes 14.57 V to be present at U10-7. Since we have 5 V at U10-3, the 14.57 V at U10-7 causes 2.75 V to be at U10-1 and U6-8. Since U6-9 is going between 10.17 V and 2.78 V, the U6-14 output is always high, giving a 100% duty cycle. Using a typical value of .2 V at U10-5 and the same R61 setting, 50.0 KΩ, the voltage at U10-7 is 10.2 V, and the voltage at U10-1 is 3.778 V. U6-9 will rise from 2.78 V to 3.778 V in approximately 12.7 µs. Since the period of the reference waveform is 165 µs, this causes a 92% duty cycle. Thus, as the speed-change motor current increases, so does the duty cycle of the SPEED ENABLE 6 KHz pulses. R61 is set so that "hunting" will not occur at the upper speed ranges when using a programmable controller such as a 645 or Q-series monitor. This duty cycle is likely to be in the 75% range which occurs when JP2-2 is at 5.67 V, or U10-7 at 2.13 V. Given the same typical motor current, R61 is set at 9.65 KΩ.

The SPEED MOTOR CURRENT signal is also routed to U6-5. On a pulse by pulse basis the current is compared to the voltage threshold determined by R24 and R25. If that voltage is exceeded, U6-2 goes high, resetting U14, thereby turning off the SPEED ENABLE pulse until the next cycle begins (i.e. when U6-1 goes low, is inverted by U5, and sets the U14 latch).

When the treadmill goes from minimum to maximum rated speed, SPEED FEEDBACK varies from approximately 5.4 V to 10 V. This is halved by R69 and R65 to provide a voltage swing of 2.7 V to 5 V at U10-3. Neglecting the contribution of the torque circuitry (ie. U10-7 = 0 V), U10-1 varies from 3.3 V to 6.2 V. This increasing voltage causes a decreasing pulse width at SPEED ENABLE (U6-14) as the treadmill increases in speed. This causes the speed change motor to move much faster during speed changes at low speed than it does during speed changes at high speed.

Note that U7-11 pulls SPEED ENABLE low when the belt is stopped. This inhibits activation of the Speed-Change motor.

STOP BELT

(Refer to Sht 5 and 6.) The treadmill belt is stopped by interrupting the current path which comes from the contactor coil at J10-4, through Q3, out to the controller at STOP (J11-1,18), back from the controller at START/STOP (J11-2), and through Q2 to ground.

The treadmill user normally stops the belt by interrupting the connection between J11-1,18 and J11-2. When J11-1,18 cannot conduct current and U7-14 is high (open-collector), the contactor coil is released. J10-4 is pulled high by the contactor coil, which turns off Q1 via R11 and CR15, removing the base drive for Q2. The +23 V also goes to U7-6 via R55 which causes U7-11 to go low, inhibiting any normal speed change. U17-3 is also connected to J10-4 via R115. When J10-4 goes high, U17 causes U11-11 to be clocked. U11 determines whether the treadmill should decelerate from above the "threshold" speed. See the description of HI SPEED DECEL on page 3-8.

EMERGENCY OFF SWITCH

(Refer to Sheet 5.) Pressing the Emergency Off switch stops the belt without a high-speed deceleration by breaking the current path at Q3, as discussed in the preceding section. In doing so, it also inhibits further operation of the START BELT, GRADE INCREASE, or GRADE DECREASE switches on the treadmill controller until after the Treadmill Reset switch located on the side of the treadmill is pressed.

If an Emergency Off switch is installed, pressing it causes J10-5 to be pulled low through J10-3. This low causes U12-4 to go high, setting U14-10 high through CR35. The high at U14-10 causes the belt to stop by turning off Q3 via CR33 and U7-2,15. It also turns on the Reset Switch LED via U7-4,13.

The low at U7-13 is sent to U5-9 (Sheet 4) via CR23. This inhibits any grade change command from the controller by shunting the signal across R23.

DRIVE MOTOR FAULT

(Refer to Sheet 6.) A protection device in the drive motor causes the motor to shut down when it becomes over-heated. When this occurs it is sensed by the circuit board. The START BELT current path discussed in preceding sections is then interrupted at Q3. Also, DS4 on the PCBA is illuminated and a MOTOR FAULT indication is sent to the treadmill controller via J11-19. Operation of the controller's START BELT switch is inhibited until the Treadmill Reset switch on the side of the treadmill is pressed after the drive motor has cooled down. This will also clear the MOTOR FAULT indication.

Note

If the Treadmill Reset switch does not clear the MOTOR FAULT indication, the drive motor has not had enough time to cool down sufficiently.

A thermal switch in the drive motor, under normal conditions, shorts J6-3 to J6-5. When an overload condition occurs, this switch heats up and opens, causing line voltage to appear across J6-3,5. This causes U3 to pulse on, pulling pin 5 low. The low at U3-5 is latched by U9-11,10 and U9-9,8.

The low at U9-11 is inverted at pin 10 and sent to U4-4. This lights DS4 and sends a Motor Fault error indication to the controller.

The high at U9-10 is inverted by U9-9,8, sending a low to U8-2 (Sht 5 of 6). At this time, U14-10 is low, so U8-1 is low. The lows at U8-1 and U8-2 cause U8-3 to go high, setting U14-10 high through CR37. After the R39/C27 delay, U8-1 goes high, removing the set from U14-12. (Note that U14-10 stays latched high.)

As with the Emergency-Off condition described previously, the high at U14-10 inhibits START BELT and turns on the Reset Switch LED.

As long as the thermal switch is open (ie. in the overload state), pressing the Reset Switch resets U14-10 low, which causes the contactor to close. This again sends line voltage across J6-3,5, pulling U3-5 low. As described above, this sets U14-10 high, opens the contactor, and lights the Reset Switch LED. When the thermal switch has cooled sufficiently to close, normal operation of the Reset Switch resumes as described below.

SLOW-SPEED THRESHOLD

(Refer to Sheet 5.) As part of the tach pulse frequency-to-voltage conversion referred to in the SPEED FEEDBACK section, above, each edge of the pulses (leading and trailing) generates a 0.3 ms pulse. The time between these pulses provides an immediate indication of the treadmill belt speed. By discharging a capacitor with each pulse and allowing the capacitor to be charged through a resistor between pulses, a larger peak voltage on the capacitor indicates a slower speed. R88 is used to set a reference voltage which, when exceeded by the peak capacitor voltage, provides an indication that the treadmill belt speed is below the slow-speed threshold. This method is used because the normal speed feedback signals react too slowly to a rapid speed change, which occurs when the treadmill is in a Hi-Speed-Decel mode (see next section). With this method the Hi-Speed-Decel mode is exited

within milliseconds of reaching the Slow-Speed Threshold.

TACH PULSES goes low for 300 µs and high for a time determined by the treadmill speed; the slower the speed, the longer the duration. When low, TACH PULSES discharges C48 through CR45; when high, C48 charges through R89. R88 is adjusted to an appropriate reference voltage for the slow-speed threshold desired. (the higher the voltage, the lower the threshold speed). When the treadmill speed is above the threshold, C48 does not charge above the reference voltage at U17-5 before the next low from TACH PULSES discharges C48. This keeps U17-7 high and U11-5 low. The low to high transition of TACH PULSES clocks through the U11-5 signal and inverts it at U11-2. Thus, when the treadmill speed is above the slow-speed threshold, U11-2 is high. The high at U11-2 lights DS3 via U7-7,10 to indicate an "above-threshold" speed.

When the treadmill speed is below the slow-speed threshold, C48 will charge above the reference voltage at U17-5 before the next low from TACH PULSES discharges it. This causes U17-7 to pulse low, discharging C35 through CR34. When TACH PULSES goes low, C35 will begin charging through R57 and R91. In the 300 µs that TACH PULSES signal is low, the voltage at C35 will increase by a maximum of 50m V. Therefore, when TACH PULSES goes high, a high is still present at U11-5, causing U11-2 to be clocked low.

Note that closing switch SW1-7 and -2 will keep the open-collector output of U17-7 low. This provides a "below-threshold" indication regardless of treadmill speed or the setting of R82. This switch should only be used during calibration or troubleshooting.

RESET SWITCH / HIGH-SPEED DECEL

(Refer to Sheet 5.) The Treadmill Reset switch is inactive (i.e. pushing it has no effect) unless the Reset Switch LED under the switch cap is illuminated. This LED will be illuminated after any of the following conditions:

1. Return of power to the treadmill. For example, the treadmill line cord could be unplugged and then plugged back in, wall outlet circuit breaker cycled, or momentary power interruption from the power utility.
2. Use of the treadmill Emergency-Off switch.
3. Occurrence of a drive motor overload condition. (A MOTOR FAULT indication should be present on the controller.)
4. A High-Speed-Decel time-out. (i.e. the treadmill has been stopped above the Slow-Speed Threshold, but was unable to decelerate to the threshold speed within the time-out period, 8 seconds, typically.)

If the Treadmill Reset Switch is illuminated, pressing it will turn off the LED and immediately start the treadmill belt. The belt speed will be checked automatically and a high-speed deceleration will occur, if necessary. The treadmill belt will then stop and normal treadmill operation is enabled.

A high-speed deceleration will also occur if a normal STOP BELT is performed while the treadmill belt speed is above the Slow-Speed Threshold. A High-Speed Decel is performed by rectifying 110 VAC and routing it to the Speed-Change motor with the polarity such that a deceleration occurs. During a High-Speed Decel the treadmill belt speed can decelerate from its maximum rated speed to its Slow-Speed Threshold in approximately 4 seconds.

When U14-10 is high, U12-2 is low, enabling the Reset Switch at J8-1 and J8-2. When the Reset Switch is pressed, J8-1 shorts to J8-2, C41 discharges through CR40, and U8-6 pulses low, causing U14-10 to be latched low. This low causes a high transition at U12-2, which pulses through C43 to set U11. Note that this is the same condition which exists when the BELT STOPPED signal from U17-1 clocks U11 while the ABOVE THRESHOLD signal from U11-2 is high. The only difference is that only the Reset switch discharges C41.

When U11 is set, the treadmill is in the High-Speed Deceleration mode. The high at U11-13 inhibits the user from starting the belt via CR32 and U7-2,15 and it also starts the belt by pulling the contactor low via U7-3,14. The low from U11-12 is inverted by U12-11,10 and sent

to U12-13 via R73. If U11 was set via the Reset Switch, C41 is discharged, and U12-12 will not go low until C41 charges through R72 and R73. This delay allows the ABOVE THRESHOLD signal from U11-2 to reach a valid state prior to the decision of whether or not to activate the MAX SPEED CHANGE/ signal. If U11 was set by stopping the belt above the "threshold" speed the low transition at U12-12 is not delayed. The low at U12-12 activates the MAX SPEED CHANGE/ signal via U9-3,4 and U7-5,12. This causes relay K4 (Sheet 2 of 6) to be activated, sending rectified 110 VAC to the Speed Motor with the polarity such that the treadmill belt speed will rapidly decelerate. The low from U12-12 (Sht 5 of 6) also goes to U8-9. As noted above, U14-10 is low and this low goes to U8-13. With U8-9 and U8-13 low, the ABOVE THRESHOLD signal from U11-2 can reset U11-10 whenever it goes low (indicating a speed below the threshold) This resets the Hi-Speed Deceleration mode, enabling the treadmill user to start the belt.

Note that when U12-12 goes low, C20 begins discharging through R40. If the ABOVE THRESHOLD signal from U11-2 does not go low before C20 discharges below the U12-9 threshold, U12-8 goes high and U14-10 is latched high. This high:

- resets U11-10 through U8-13,11 and U9-1,2
- inhibits the user from starting the belt via CR32 and U7-2,15, and
- turns on the Reset Switch LED via U7-4,13.

If the treadmill is functioning properly, the treadmill should be able to decelerate from maximum speed to minimum speed in a few seconds. The circuitry described above ensures that when too much time has elapsed in the High-Speed Deceleration mode, the treadmill returns to the Reset Required mode.

GRADE CHANGE

(Refer to Sheet 4.) A GRADE CHANGE command from the treadmill controller causes line power to be routed to the elevation motor. If at this time the Grade Direction command from the controller is active (high) the elevation motor will turn to cause the grade to increase, otherwise it will turn to decrease the grade. A mechanical torque-limiter and mechanical stops provide grade limits.

A grade change occurs when J11-4 is driven high. If J11-3 is driven high at this time, the grade increases. Otherwise, the grade decreases.

J11-3 activates K1 & K2 via U4-2,15. K1 and K2 configure the grade motor for the proper direction. K3 routes power to the grade motor via K1 and K2. K3 is activated by J11-4 after a 0.2 second delay (approximately) caused by R23/C23. This delay allows K2 to reach the proper state prior to routing power through it.

When a grade change becomes inactive, C23 rapidly discharges through CR22 and R22 while C21 discharges through the approximately 10 KΩ input resistance at U4-2. This maintains the direction configuration of K1 and K2 in place until after power has been removed by K3.

GRADE FEEDBACK

(Refer to Sheet 2.) A linear potentiometer is mechanically connected to the elevation shaft. As the elevation changes the potentiometer turns. This provides a voltage to the circuit board (J9-3) which varies inversely with the grade. This voltage is converted to a current and routed to the treadmill controller via J11-10. This current is calibrated so that 1 mA = 2% grade.

A 5 KΩ linear pot is connected to J9. As the treadmill grade increases, the voltage at J9-3 decreases. This voltage is scaled by R101 and R102 to provide an appropriate voltage at U20-5 (after the R100/C56 noise filter). R86, R87, R105, R106, and Q4 convert this scaled voltage to an appropriate current (1 mA = 2% grade). R87 is used to adjust the Grade Feedback to 0mA when the treadmill is level. This pot is set with R105 turned fully clockwise. Note that at this time the R87-2 voltage exceeds the U20-5 feedback voltage by the emitter-base voltage of Q4. When R87 is set, R105 can be set by raising the treadmill to 25.2% grade (14°) and turning R105 counterclockwise to provide a 12.6 mA current at J11-10.

SECTION 4 ASSEMBLY, DISASSEMBLY, AND CALIBRATION PROCEDURES

INTRODUCTION

This section contains the following maintenance procedures:

- Repair, replacement, disassembly and reassembly
- Mechanical adjustment and alignment
- Calibration
- Post-maintenance test

Since the treadmill PCB Assembly is a field-replaceable module, no procedures are included for component-level repair.

WARNING

Observe the following precautions when servicing the treadmill:

- ***Do not start the walking belt or press the RESET switch when someone is on the treadmill. The belt starts moving immediately, and the sudden start and subsequent loss of balance could cause serious personal injury.***
- ***Do not wear loose clothing around rotating machinery.***
- ***High voltage is present when the treadmill hood is removed and treadmill is plugged in. Unplug the power cord every time you remove the hood to prevent high voltage electrical shock.***
- ***Keep fingers away from chains and rotating parts.***

NOTE

All instructions are oriented as if you were exercising on the treadmill.

REMOVING THE TREADMILL HOOD

1. Unplug the treadmill power cord from the wall socket.
2. Use a Phillips screwdriver to disconnect the ground wires from the handrail at the front of the treadmill. See Figure 4-1 on page 4-2. Leave the wire connected to the hood.
3. Loosen the thumbscrews to disconnect the controller cable from the treadmill (Figure 4-2).
4. Pull up on the handrail and remove it.
5. Remove the four Phillips screws that attach the hood to the headframe. There are two screws at the front and one on each side.
6. Lift the hood straight up and off of the treadmill.
7. To replace the hood, perform Steps 1-6 in reverse order.

MOTOR ASSEMBLIES

Grade motor removal and replacement are described under elevation system maintenance (page 4-10).

Drive Motor

Replace the drive motor when:

- The internal overload protector fails.
- The motor start switch (centrifugal switch) fails.
- The motor burns out.

1. Remove the treadmill hood (page 4-1).
2. Remove the cable ties that secure the motor wires.
3. Disconnect the wires from the drive motor contactor. Figure 4-3 on page

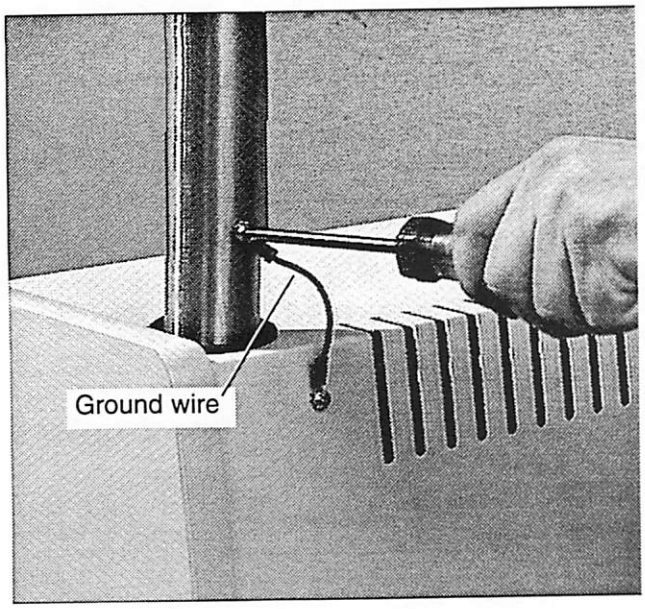


Figure 4-1. Ground Wire Connection

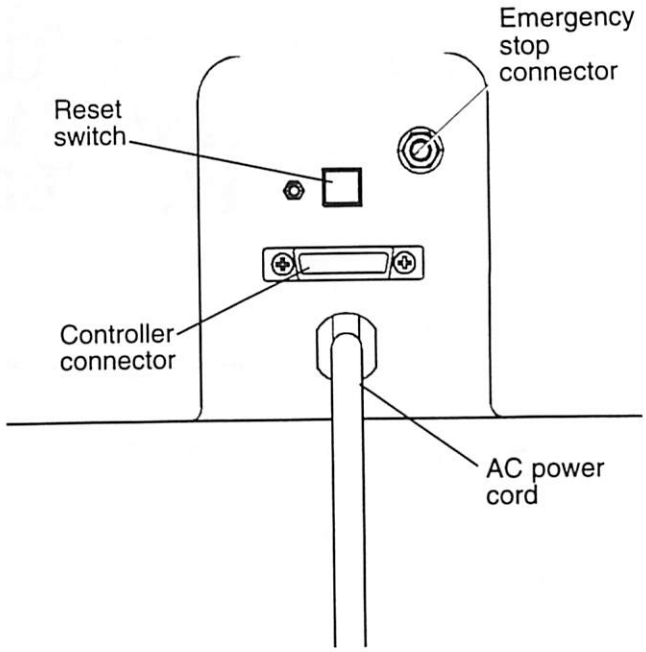


Figure 4-2. Reset switch and connectors

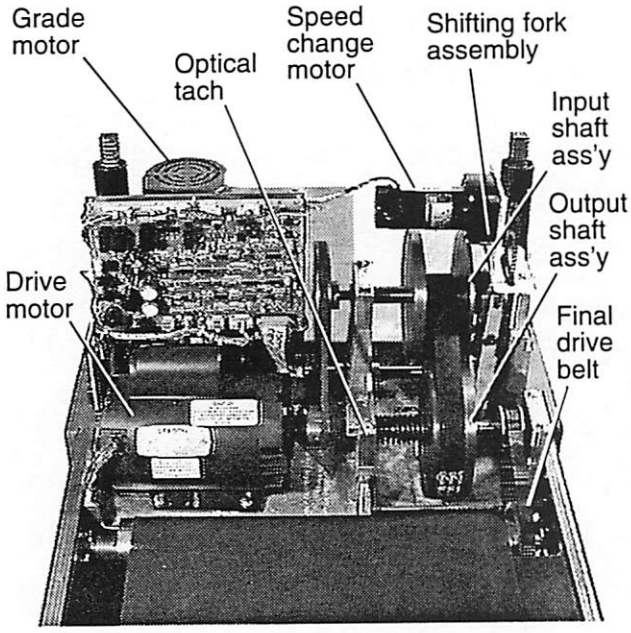


Figure 4-3. Drive Motor

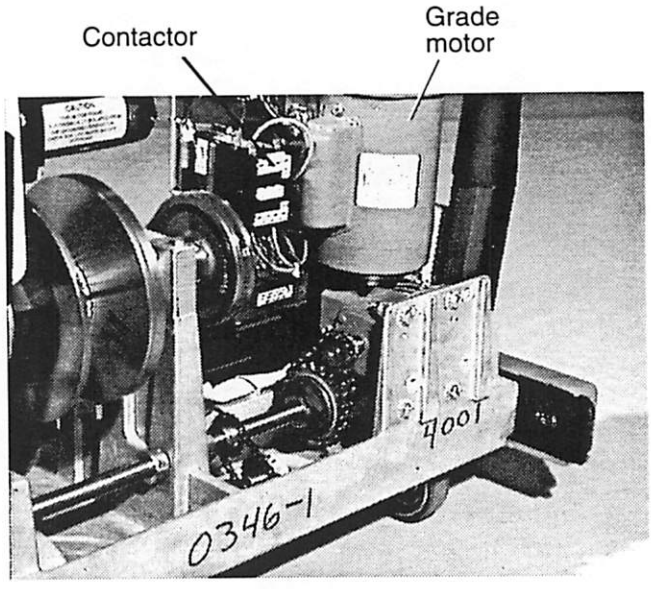


Figure 4-4. Drive Motor Contactor

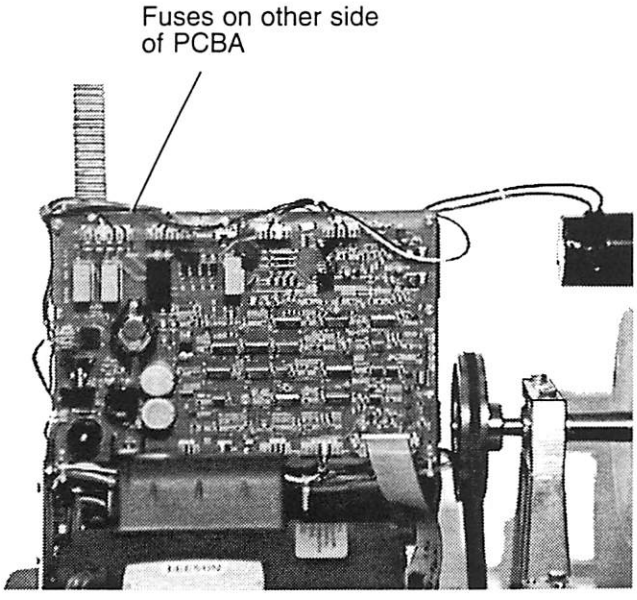


Figure 4-5. Treadmill PCB Assembly

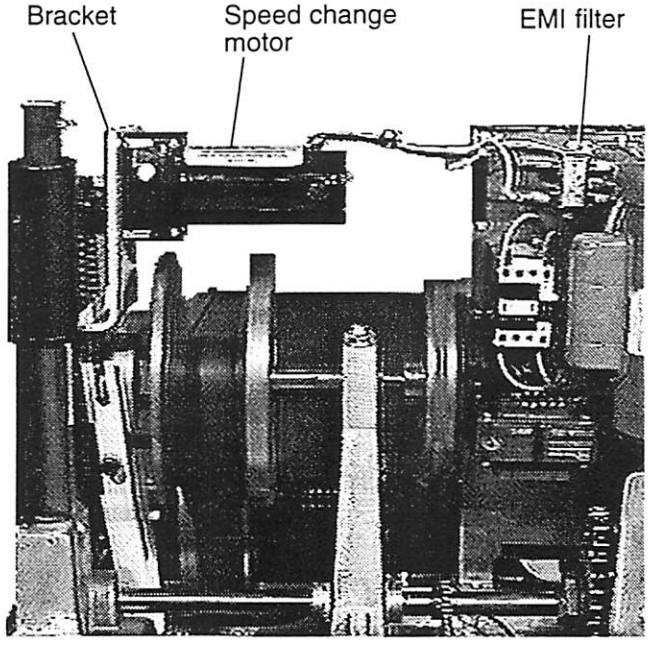


Figure 4-6. Speed Change Motor and Bracket

4-2 shows the drive motor, while Figure 4-4 shows the contactor.

4. Unplug motor connection wire J6 to the treadmill PCB Assembly.
5. Remove one clamp on each side of the drive motor. These two clamps secure it to the motor base plate.
6. Slip the V-belt off the motor pulley, then lift the drive motor off the base plate.
7. Install a new drive motor following Steps 5-6 in reverse order.
8. Attach the electrical connectors and reassemble the treadmill following Steps 2-4 in reverse order. The wires are color-coded.
9. Replace the hood.

Drive Motor Contactor (K1)

1. Remove the treadmill hood as described on page 4-1.
2. Remove the wires to the contactor (Figure 4-4):
   a. Two wires to the motor.
   b. Two wires to the power cord.
   c. Two wires to connector J10 on the treadmill PCB Assembly.
   d. Three wires to connector J3 on the PCB Assembly.
3. Replace the contactor with a new one, then reconnect the color-coded wires you removed in Step 2.
   a. For the Q50 and Q55, Quinton drawings 031475 and 031554 shows the connection points.
   b. For the Q55XT and Q65, refer to drawings 031474 and 031554.
4. Replace the treadmill hood.
5. Restore power and test the treadmill.

Speed Change Motor

Replace the speed change motor if the gears break or if the motor burns out.

1. Remove the treadmill hood (page 4-1).
2. Unplug the quick disconnects from the EMI filter to the motor (Figure 4-6).
3. Loosen the four screws and washers that hold the speed change motor to the bracket.
4. Slip the chain off the sprocket, then remove the sprocket from the motor.

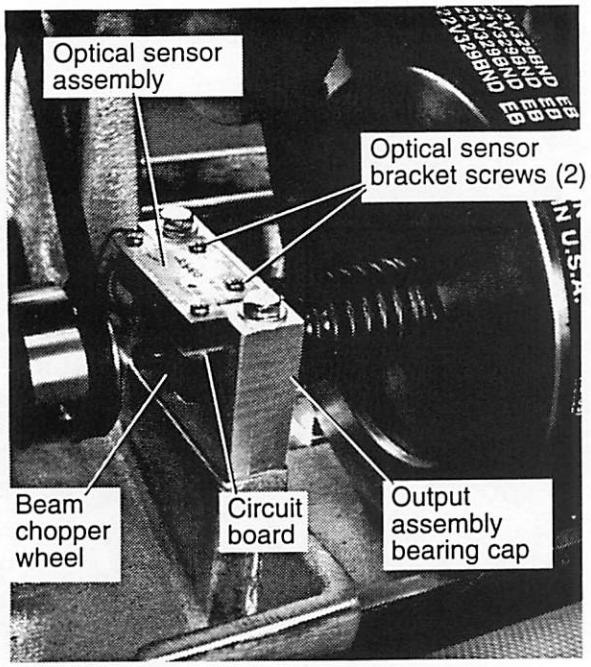


Figure 4-7. Tachometer Optical Sensor

5. Remove the four screws you loosened in Step 3, then remove the speed change motor.
6. Replace with a new speed change motor, following Steps 3-5 in reverse order.
7. Attach the electrical connectors and reassemble the treadmill following Steps 2-4 in reverse order. The wires are color-coded.

NOTE

Be sure to take the slack out of the motor chain when you replace it.

8. Replace the treadmill hood.
9. Restore power to the treadmill and test the speed limits.

TACHOMETER ASSEMBLY

Optical Sensor Replacement

1. Remove the treadmill hood as described on page 4-1.
2. Remove the cable ties to tachometer connector J7 at the PCB Assembly, then unplug it. See Figure 4-5 on page 4-3.

CAUTION

To prevent damage to the beam chopper, lift the tachometer bracket straight up to remove it. Verify that the tachometer optical sensor is securely mounted before operating the treadmill.

3. Remove two screws on the top of the tachometer optical sensor bracket, then lift the bracket straight up (Figure 4-7).
4. Remove and save the two screws and spacers that hold the small circuit board in place on the bracket, then remove and discard the old board.
5. Install a new small circuit board using the screws and spacers from Step 4.
6. Reinstall the tach bracket onto the top of the bearing cap.
7. Align the tachometer beam chopper per the procedure on this page.
8. Reconnect connector J7.
9. Tie down the wire harness with cable ties.

Beam Chopper Replacement

1. Remove the hood (page 4-1.)
2. Remove the two screws that hold the tachometer optical sensor in place, then move the sensor out of the way. See Figure 4-7.
3. Remove the beam chopper. Use a 1/8" Allen wrench to remove the screw and the chopper wheel from the end of the output shaft.
4. Replace with a new beam chopper.
5. Replace the tachometer optical sensor on the bearing cap.
6. Align the beam chopper wheel per the procedure in the following paragraph.

Beam Chopper Wheel Alignment

1. If required, unplug the treadmill and remove the hood (page 4-1).

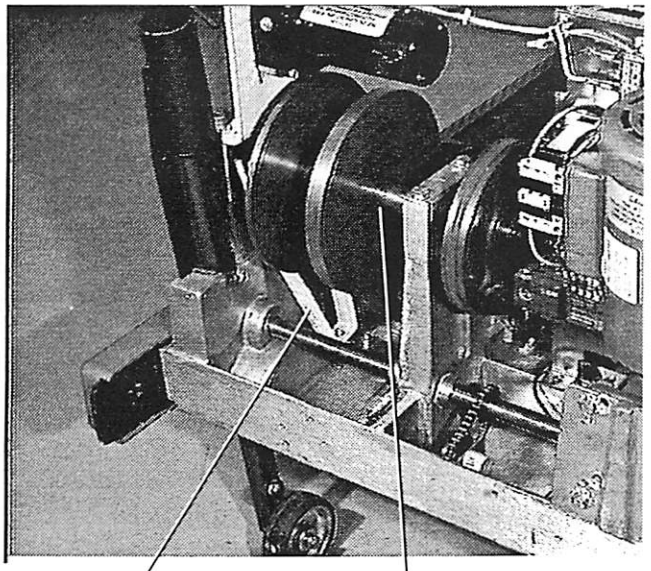


Figure 4-8. Input Shaft Assembly

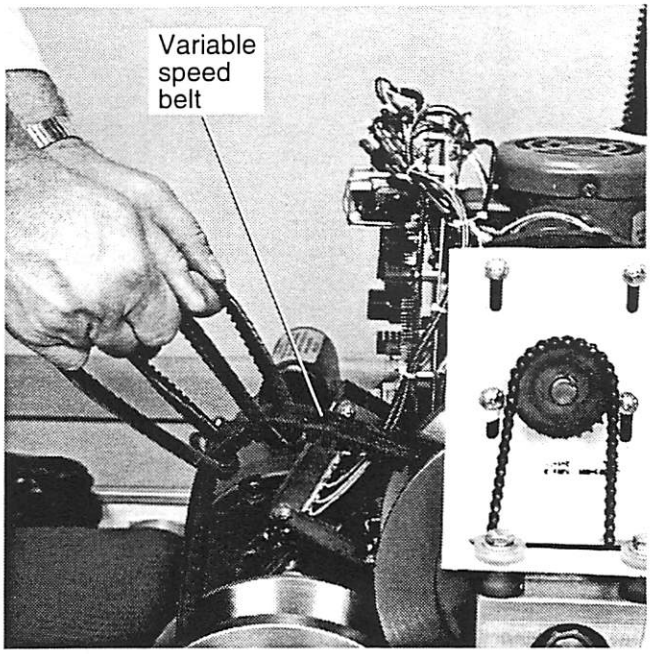


Figure 4-9. Loosening the Variable Speed Belt

2. Center the beam chopper wheel by sliding it along shaft with a screwdriver and checking its relationship to the tachometer LED.
3. Move the beam chopper until it is in the exact center of the gap.

REPLACING THE TREADMILL PCB ASSEMBLY

1. Remove the power cord from the wall socket.
2. Remove the hood (page 4-1).
3. Unplug all connectors from the PCB Assembly (Figure 4-5 on page 4-3).
4. Remove the twelve hex nuts attaching the PCB Assembly to the PCB mounting bracket.
5. Remove the PCB Assembly.
6. Replace with a new Assembly following Steps 1-5 in reverse order.
7. Calibrate the grade feedback and the speed feedback as described on page 4-20 and 4-21.

INPUT SHAFT ASSEMBLY PROCEDURES

Input Shaft Assembly and Speed Change Spindle Assembly Removal

NOTE

Special adhesives and a ratchet wrench with a long extension are required to remove and install a new assembly. Read all removal and replacement instructions before continuing.

1. Remove the treadmill hood as described on page 4-1. Figure 4-8 shows the input shaft assembly.

CAUTION

Be careful not to damage the bearings and caps on the input shaft. If the shaft is scarred or if the movable sheave is frozen on the input shaft, the entire shaft assembly must be replaced.

2. Place a rope or flexible belt around the variable speed belt, then pull straight up to loosen belt. See Figure 4-9.

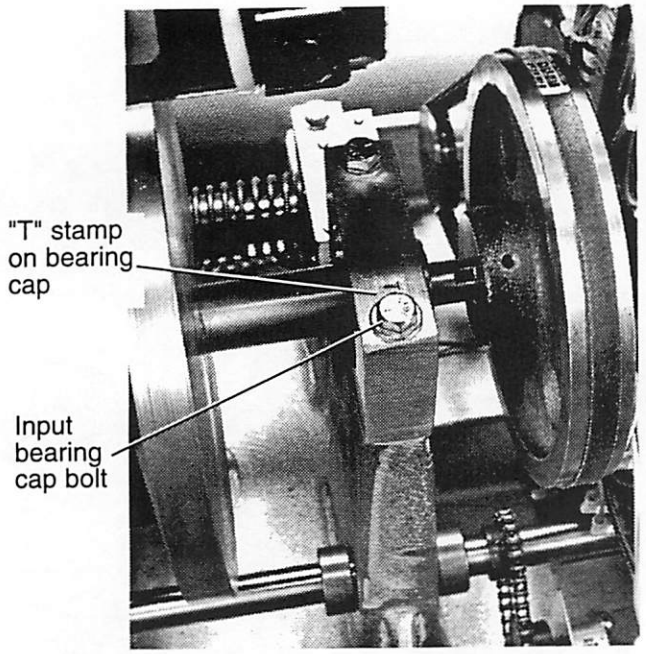


Figure 4-10. "T" Stamp Shows Bearing Cap Orientation

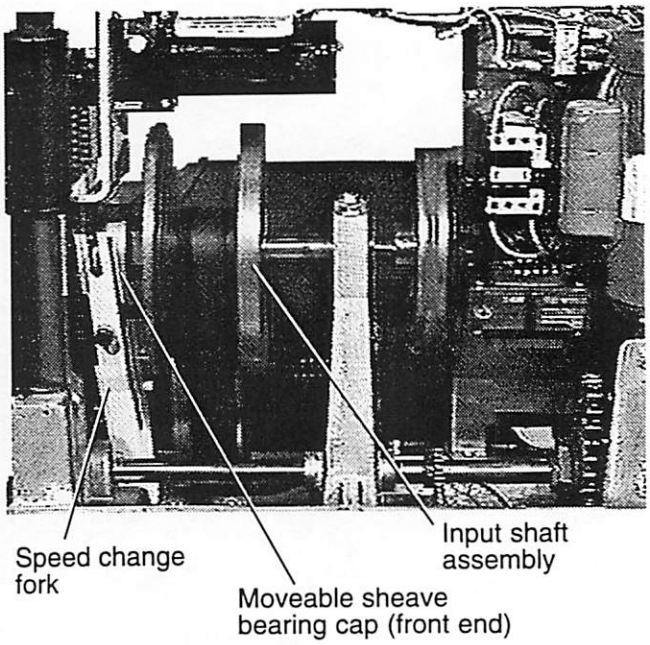


Figure 4-11. Speed Change Mechanism

3. Remove the V-belt from the machined input shaft pulley.
4. Unplug the quick disconnects from the two speed change motor leads at the EMI filter. See Figure 4-6 on page 4-3.
5. Loosen, *but do not remove,* the four screws that hold the speed change motor to the bracket (Figure 4-6).
6. Slacken the chain and disconnect the master link (if required), then remove the chain from the sprocket.
7. Use a ratchet wrench with a long extension to remove the four screws that hold the bearing caps in place (Figure 4-10).
8. Carefully remove the speed change motor and bracket, saving the hardware.
9. Lift the entire input shaft assembly straight up and back towards the walking deck, then slip the sheave out of the transmission belt.
10. To remove the speed change spindle assembly:
    a. Remove the retaining ring on the right end of the spindle.
    b. Pull the speed change fork to the left until the spindle bearing is clear of the headframe.
    c. Lift the spindle assembly out of the headframe (Figure 4-11).

Input Shaft Assembly Replacement

CAUTION

Read these instructions completely before starting this procedure! Loctite™ Primer T, Loctite 660, and Loctite RC 680 are required to install a new shaft assembly. The input shaft bearing caps and pulley must be bonded to the shaft assembly before use, and the adhesive requires a ***minimum cure time of six hours*** *before operating the treadmill.*

1. Remove the speed change motor, bracket, and input shaft assembly from the treadmill following the procedure described on pages 4-3 and 4-5.
2. Align the speed change fork with the pin on the base of the headframe, then insert the spindle bearing into the bore provided in the headframe (Figure 4-11). Refer to section view R-R of drawing 31474 or 31475, notes 3 & 4 or 4 & 5 at the end of this manual.
3. Install the retaining ring onto the right side of the spindle.

4. Pull the transmission belt to the bottom of the transmission output pulley assembly and spread the output assembly sheaves apart to create slack in the belt.

NOTE

Perform the following step only if you are installing a new input shaft assembly. Otherwise, go to Step 6.

5. Refer to the headframe assembly drawing (p/n 031474 or 031475). If you are installing a new shaft assembly, prepare the bearing caps and the input assembly following these preparation and gluing procedures:
   a. Prime the outer diameter of the bearing on the output shaft assembly and the inside diameter of the bearing caps (p/n 013705-001/003) using Loctite Primer T (p/n 014900-001).
   b. Coat the outside of the bearings and the inside of the cap with Loctite 680 retaining compound (p/n 012465-002).
   c. Assemble the cap over the bearing.
6. Install the V-belt pulley on the shaft.
   a. Clean the input shaft in the keyway area and the V-belt pulley bore, then prime with Loctite Primer T.
   b. Apply Loctite 660 to the keyways in the input shaft and to the pulley, then position the key in the shaft keyway. Lightly tap the key in the keyway if required.
   c. Apply Loctite 680 to the shaft from the end of the shaft to the end of the keyway.
   d. Install the pulley on the shaft with the hub facing the bearing cap, then slide the pulley and key until the face is ⅛" from the end of the shaft.
   e. Install and torque the two pulley set screws using Loctite 242.
   f. Wipe the excess adhesives from the shaft and pulley.
7. Immediately mount the shaft assembly to the headframe:
   a. Put the end of the input shaft assembly through the slack in the transmission belt, then
   b. Insert the movable sheave's bearing cap into the fork on the speed change spindle assembly. The rounded end of the cap faces *up* (Figure 4-11).

NOTE

Verify that the **"T"** stamp on each bearing cap faces *up*. See Figure 4-10 on page 4-6.

8. Reinstall the speed change motor and bracket by reversing Steps 4-5 in the *previous paragraph* ("Input Shaft Assembly and Speed Change Assembly Removal").
9. Insert the mounting screws through the bearing caps, and rotate the shaft assembly by hand before tightening the screws. The bearing on the fixed sheave end of the shaft assembly must be seated in the bearing cap.
10. If you installed a new assembly, wait *six hours* for the adhesive to cure before testing the treadmill. It may be more convenient to let the treadmill sit overnight before reassembling and testing the treadmill.

CAUTION

Do not test or use the treadmill for at least six hours after using adhesive to assemble a new input shaft.

11. Install the V-belt between the motor pulley and transmission pulley. Verify that the alignment is correct, then tighten the set screws on the input pulley.
12. Attach the electrical connectors and reassemble the treadmill as required. The wires are color-coded.
13. After the adhesive has cured (Step 10), replace the hood, restore power to the treadmill, and test the operation of the new input shaft. Verify that the treadmill operates through its full speed range.

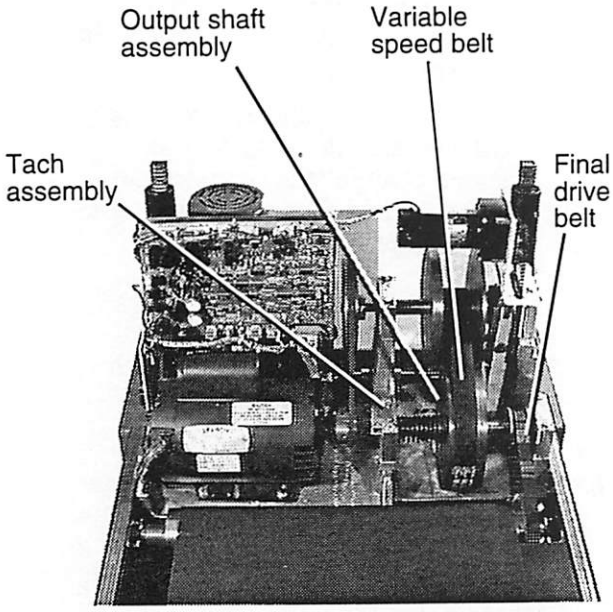


Figure 4-12. Output Shaft Assembly and Belts

OUTPUT SHAFT ASSEMBLY PROCEDURES

Output Shaft Assembly Removal

NOTE

Special adhesives and a ratchet wrench with a long extension are required to remove and replace the assembly. Read all removal and replacement instructions before continuing.

CAUTION

Be careful not to damage the bearings and caps on the output shaft. If the shaft is scarred or if the movable sheave is frozen on the shaft, the entire shaft assembly must be replaced.

1. Remove the treadmill hood (page 4-1). Figure 4-12 shows the output shaft assembly.
2. Remove the two screws that secure the tachometer optical sensor bracket, then lift the sensor and bracket straight up to remove it from the bearing cap. Lifting it straight up will avoid damage to the beam chopper. See Figure 4-7 on page 4-4.
3. Use a 1/8" Allen wrench to remove the tachometer beam chopper.
4. Use a ratchet wrench with a long extension to remove the four screws that hold the bearing caps in place.
5. Slip the output shaft assembly out of the variable speed belt and the final drive belt, then remove it.

Output Shaft Assembly Replacement

CAUTION

Read these instructions completely before starting this procedure! Loctite Primer T, Loctite 660, and Loctite RC 680 are required to install a new shaft assembly. The output shaft bearing caps must be bonded to the shaft assembly before use, and the adhesive requires a ***minimum cure time of six hours*** *before operating the treadmill.*

1. Remove the output shaft assembly as described in the previous paragraph.

NOTE

Perform the following step only if you are installing a new output shaft assembly. Otherwise, go to Step 3.

2. Refer to the headframe assembly drawing (p/n 031474 or 031475). If you are installing a new shaft assembly, prepare the bearing caps and the input assembly following these preparation and gluing procedures:
   a. Prime the outer diameter of the bearing on the output shaft assembly and the inside diameter of the bearing caps (p/n 013705-001/003) using Loctite Primer T (p/n 014900-001).
   b. Coat the outside of the bearings and the inside of the cap with Loctite 680 retaining compound (p/n 012465-002).
   c. Assemble the cap over the bearing.
3. Immediately put the end of the output shaft assembly through the slack in the variable speed belt (Figure 4-12).

4. Slip the final drive belt over the timing sprocket on the shaft assembly.
5. Spread the pulley sheaves apart slightly to seat the variable speed belt in the sheaves, then install the output shaft by placing the bearing caps on the head frame mounting pads.

NOTE

Be sure that the bearing cap with the threaded holes on top is installed on the *left* side of the shaft assembly. The holes are used for mounting the optical tach assembly.

6. Verify that the **"T"** stamp on each bearing cap faces up, then use a ratchet wrench with a long extension to tighten the screws. See Figure 4-10 on page 4-6.
7. Install the tachometer beam chopper.
8. Replace the tachometer optical sensor on top of the bearing cap, then verify that the beam chopper is aligned (page 4-5).
9. If you installed a new assembly, wait *six hours* for the adhesive to cure before testing the treadmill. It may be more convenient to let the treadmill sit overnight before reassembling and testing the treadmill.

CAUTION

Do not test or use the treadmill for at least six hours after using adhesive to assemble a new output shaft.

10. After the adhesive has cured (Step 9), install the hood, restore power to the treadmill and test the operation of the new output shaft. Verify that the treadmill operates through its full speed range.

Replacing the Variable Speed Belt

1. Remove the input shaft assembly as described on page 4-5.
2. Remove the output shaft assembly (page 4-8).

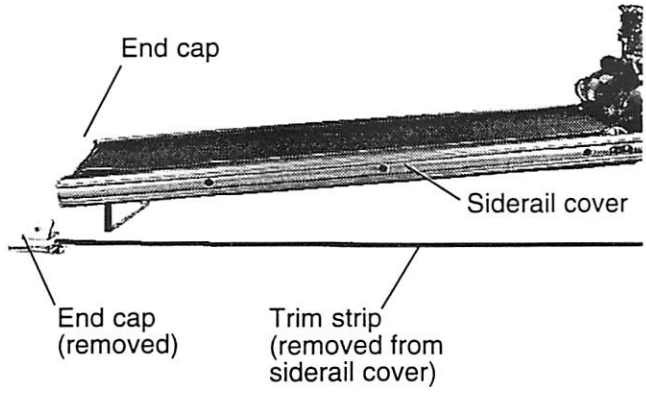


Figure 4-13. End Caps and Siderail Cover

3. Remove the variable speed belt. (Figure 4-12 on page 4-8).
4. Replace the variable speed belt.
5. Replace the output shaft assembly.
6. Replace the input shaft assembly.

Replacing the Final Drive Belt

1. Remove the hood (page 4-1).
2. Loosen the four screws (two on each side) which secure the rear roller guards at the rear of the treadmill, then slide the roller guards toward the front of the treadmill. You may need to hold the wingnuts on the underside of the treadmill deck when you loosen the screws.
3. Use a 1/2" socket wrench to remove both end caps, located on either side of the belt at the rear of the walking platform. See Figure 4-13.
4. Remove the trim strips from the siderail covers.
5. Remove the four 1/2" hex screws and nuts (two on each side) that secure the two front drive roller retainers to the frame siderail. One retainer is on

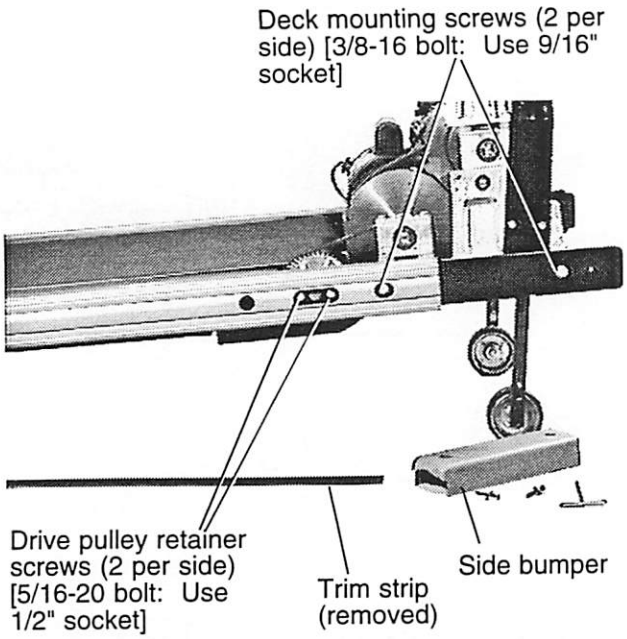


Figure 4-14. Deck Mounting Screws and Drive Pulley Retainer Screws

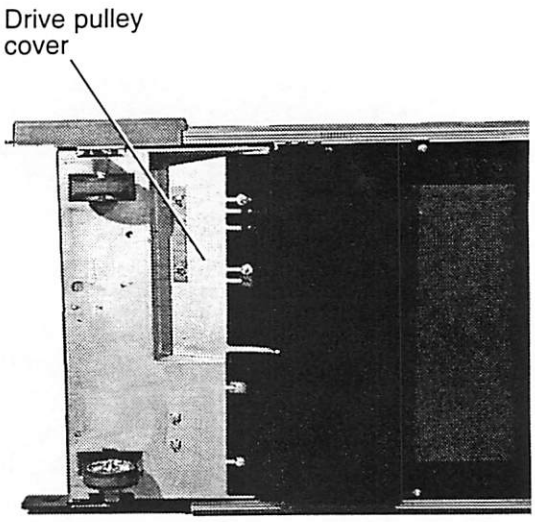


Figure 4-15. Drive pulley cover on bottom of treadmill

each side of the drive roller assembly (Figure 4-14 on page 4-10).

6. Slide the drive roller assembly to the left, then remove the final drive belt from the right side of the roller.
7. Remove the four screws that fasten the output shaft bearing caps, but do not remove the shaft assembly.
8. Slip the final drive belt under the output shaft assembly bearing cap.
9. Replace with a new belt, then remount the front drive roller assembly and output shaft assembly.
10. Reassemble the treadmill following Steps 1-7 in reverse order.
11. Adjust the walking belt tension following the procedure on page 4-17.
12. Adjust the walking belt tracking using the procedure on page 4-18.
13. Check and adjust the final drive belt tension following the procedure in the next paragraph.

Adjusting the Final Drive Belt Tension

Perform this procedure as required after installing a new timing belt, or after removing and replacing the deck assembly.

1. Remove the hood (page 4-1).
2. Use a 5/32" hex socket wrench to remove the two screws which secure the treadmill side bumpers to the siderail, then remove the bumpers.
3. Use a 9/16" socket wrench to loosen the four hex-head screws which fasten the deck assembly to the headframe, *but do not remove the screws.* (Figure 4-14).
4. Loosen, *but do not remove*, the four 7/16" hex-head screws. Two screws fasten the front of the drive roller cover to the treadmill headframe, and the other two secure the motor mount plate. They are located beneath the treadmill (Figure 4-15).
5. Set the belt tension so that an 0.11" deflection can be measured at midspan when a 3.75 lb $\pm$0.25 lb load is applied perpendicular to the belt at midspan.
   a. To *loosen* the belt, move the headframe *towards* the deck assembly.

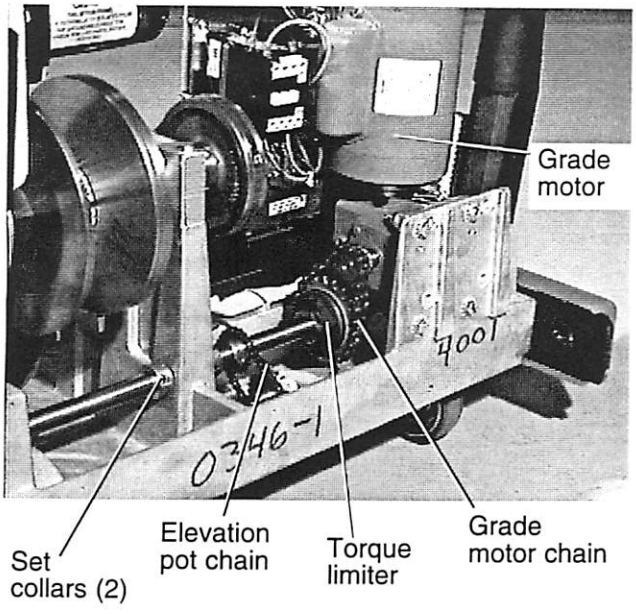


Figure 4-16. Grade Motor

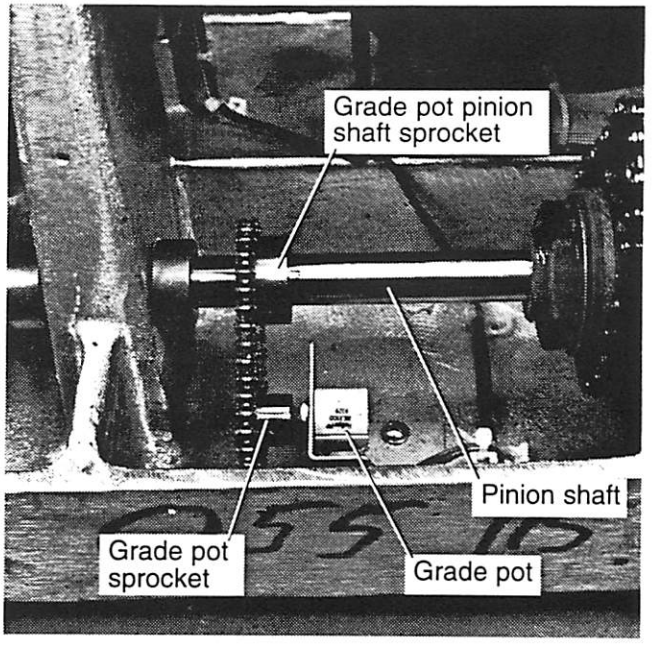


Figure 4-17. Grade Pot and Pinion Shaft

b. To *tighten* the belt, move the headframe *away from* the deck assembly.

6. Reassemble the treadmill following Steps 1-4 in reverse order.

GRADE CHANGE (ELEVATION) SYSTEM

Grade Motor

1. Block the treadmill headframe securely with 8-inch wooden blocks to ensure that the treadmill will not drop when you remove the grade motor or chain.
2. Remove the hood (page 4-1). *However, do not elevate the treadmill.*
3. Remove the cable ties that secure the grade motor wires, then disconnect the wires from the PCBA. Figure 4-16 shows the grade motor.
4. Unplug all connections to the treadmill PCB Assembly.
5. Use an 11/32" nut driver to remove the 12 hex nuts that attaches the PCBA to the mounting bracket, then remove the PCBA.
6. Remove the four screws that attach the PCBA mounting bracket to the elevation motor. Note the stackup of the isolation washers.
7. Remove the four 7/16" hex head screws that secure the elevation motor to the headframe, then remove the motor. Note the stackup of the isolation hardware on the screws.
8. Replace with a new grade change motor, following Steps 3-7 in reverse order. The PCB connectors are keyed.

WARNINGS

- ***Do not wear loose clothing around rotating machinery.***
- ***Keep fingers away from chains and rotating parts.***
- ***High voltage is present when the treadmill is plugged in.***

9. Restore power to the treadmill and test the new grade motor.
10. Test the treadmill elevation. Verify that:
    a. it operates over the full range of 0-25%.
    b. there is no binding when it moves up or down.
    c. the elevation pot chain is aligned correctly.
    d. the grade motor chain is also aligned correctly. A "popping"

d. the grade motor chain is also aligned correctly. A "popping" sound in the chain indicates that it is misaligned.

11. Turn the treadmill power off, remove the power cable from the outlet, then reinstall the hood.

Grade Potentiometer (Pot) Replacement

Read the warnings on this page before replacing the pot.

1. Remove the treadmill hood as described on page 4-1.
2. With the hood removed, restore power to the treadmill and turn the grade motor on until the set screw on the grade pot pinion shaft sprocket is visible (Figure 4-17 on page 4-11).
3. Unplug the treadmill.
4. Release the set screw.
5. Hand-turn the grade pot until the steel set screw on the potentiometer sprocket is visible.
6. Release the steel set screw.
7. Push the whole sprocket-and-chain assembly away from the grade pot.
8. Remove the 1/2" brass nut and the cable tie. The pot will come off.
9. Cut the cable ties and remove connector J9 from the PCB Assembly.
10. Replace with a new potentiometer, then reassemble following Steps 3-9 in reverse order.
11. When the grade pot, wires, and set screws are in place, calibrate the pot by following the procedure on page 4-20.

Removing the Rack Gears

1. If the treadmill will change grade, take the treadmill to approximately 12% (6-7°).
2. Lower the front of the headframe onto 8-inch wooden blocks to take the weight off the wheels.
3. Unplug the treadmill, then remove the hood (page 4-1).
4. If the rack gear is completely jammed, replace as described on page 4-13.

WARNINGS

- ***Do not wear loose clothing around rotating machinery.***
- ***Keep fingers away from chains and rotating parts.***
- ***High voltage is present when the treadmill is plugged in.***

5. Restore power to the treadmill and *decrease* grade until wheels raise about 1/2" off the floor.
6. Remove the two 9-16" hex-head screws holding the wheels to the rack gears. Note the arrangement of washers used as spacers.
7. Remove the two hex screws located above the wheels. (These screws are the rack gear stops.) Note the arrangement of washers used as spacers.
8. Loosen the set screw that secures the grade pot pinion shaft sprocket, then verify that the sprocket turns easily on the shaft. This will avoid damage to the pot. See Figure 4-17 on page 4-11.

NOTE

If the treadmill is connected to a programmable controller such as a 645 or Q4000, it may be necessary to place it in open loop mode before performing Step 8. Refer to the Operator Manual for the controller.

9. Decrease the grade until the rack gears start bouncing on the pinion shaft.
10. Unplug the treadmill.
11. Lift the rack gears straight out of the top.

Reassembling the Rack Gear

Read the warnings on this page before performing these steps.

2. Install new rack gears simultaneously so that they will be parallel.
3. Restore power to the treadmill.
4. Loosen the set screw that secures the grade pot pinion shaft sprocket, if it is not already loose, then verify that the sprocket turns easily on the shaft. This will avoid damage to the pot. See Figure 4-17 on page 4-11.

NOTE

If the treadmill is connected to a programmable controller such as a 645 or Q4000, it may be necessary to place the controller in open loop mode before performing Step 5. Refer to the Operator Manual for the controller.

5. Decrease the grade until the gears bounce two or three times, then increase the grade. This should cause both rack gears to mesh in exactly the same place.

NOTE

When performing the next step, it may be necessary to turn the grade pot slightly to keep the elevation motor running.

6. Run the rack gears down past the bottom of the headframe.
7. Check under the bottom of the headframe to verify that the rack gears are meshing properly. The gears should protrude an equal distance.
8. Run the rack gears down until there is enough room to replace wheels.
9. Replace the two screws that hold the wheels to the rack gears. Be sure to:
   a. replace washers used as spacers in the correct arrangement.
   b. torque the screws tightly to 46 ft-lb ±4 ft-lb.
10. Replace the two screws and washers removed in Step 7 under "Removing the Rack Gears" (page 4-12). These are the rack gear stops. Torque them to 46 ft-lb ±4 ft-lb.

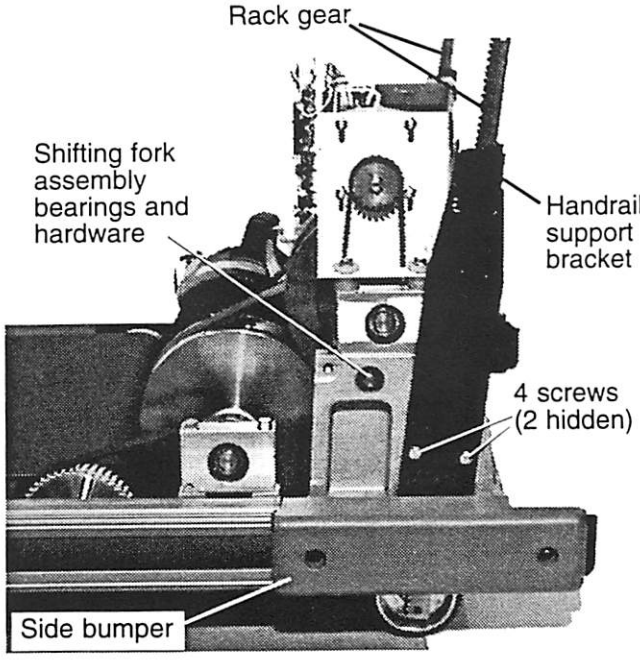


Figure 4-18. Handrail Support Bracket and Rack Gear

11. Increase the grade until the wheels touch the floor.
12. Grease rack gears with wheel bearing grease.
13. Remove the blocks that support the headframe.
14. Calibrate the grade potentiometer by following the procedure on page 4-20.
15. Turn the treadmill power off, remove the power cable from the outlet, then reinstall the hood.

Replacing a Jammed Rack Gear

1. If the rack gear is not completely jammed, follow the instructions in the previous paragraph to replace it.
2. Unplug treadmill.
3. Remove the hood (page 4-1).
4. Securely block the front and rear of the headframe with 8-inch wooden blocks to take the weight off the wheels, then raise the wheels 1/4" to 1/2" off the floor.
5. Shake each gear lightly at the top to determine which rack gear is jammed.

5. Shake each gear lightly at the top to determine which rack gear is jammed. If there is no play in a rack gear, it is jammed.
6. Remove the wheel and the rack gear stop above the wheel from the jammed rack gear.
7. Remove the two hex socket head screws which secure the side bumper.
8. Remove the four screws that hold the handrail support bracket in place, then remove the bracket (Figure 4-18 on page 4-13).
9. Slide the rack gear out sideways and remove it.
10. Inspect the gear on the pinion shaft. If it is damaged, replace *both* the rack gear and the pinion shaft (as described on the following page.)
11. Screw the handrail support bracket back into place.
12. Loosen the set screw that secures the grade potentiometer (pot) pinion shaft sprocket, if necessary, then verify that the sprocket turns easily on the shaft. This will avoid damage to the pot. See Figure 4-17 on page 4-11.

WARNINGS

- ***Do not wear loose clothing around rotating machinery.***
- ***Keep fingers away from chains and rotating parts.***
- ***High voltage is present when the treadmill is plugged in.***

13. Restore power and decrease the grade to run the other rack gear out the top.
14. Reassemble the rack gear as described in the previous paragraph.
15. Calibrate the grade potentiometer as described on page 4-20.
16. Test the treadmill elevation. Verify that:
    a. it operates over the full range of 0-25%.
    b. there is no binding when it moves up or down.
    c. the elevation pot chain is aligned correctly.
    d. the grade motor chain is also aligned correctly. A "popping" sound in the chain indicates that it is misaligned.
17. Turn the treadmill off and unplug it.
18. Replace the hood.

Replacing the Pinion Shaft

1. Remove the rack gear as described on page 4-12.
2. Remove the two hex socket head screws which secure the right side bumper to the treadmill siderail, then remove the bumper.

WARNINGS

- ***Do not wear loose clothing around rotating machinery.***
- ***Keep fingers away from chains and rotating parts.***
- ***High voltage is present when the treadmill is plugged in.***

3. Restore power to the treadmill, then use the grade motor to turn the shaft until the set screw on the grade pot sprocket is visible (Figure 4-17 on page 4-11.)
4. Loosen, *but do not remove*, the set screws from:
    a. the torque limiter
    b. the grade potentiometer pinion sprocket
    c. the two pinion shaft set collars.

    The set screws are on the pinion shaft.
5. Unplug the treadmill.
6. Remove the handrail support bracket on the right side.
7. Slide the pinion shaft out.
8. While sliding a new pinion shaft in, place the elevation sprocket, the set collars, and the grade potentiometer sprocket on the shaft.
9. Replace the handrail support bracket you removed in Step 8.

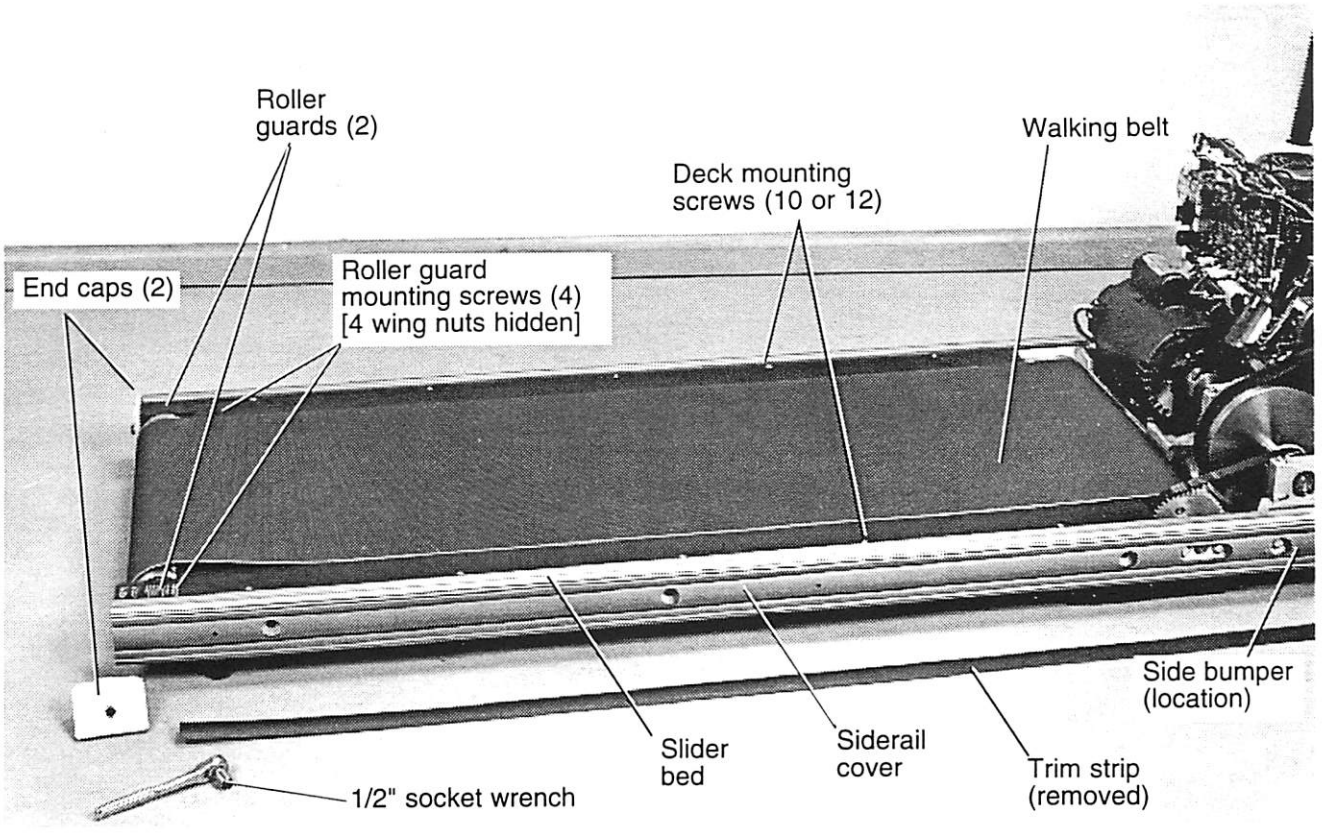


Figure 4-19. Walking Deck Assembly

10. *Before performing Step 11, verify that neither end of the pinion shaft touches the handrail support brackets.*
11. Tighten the set screws on the set collars.

NOTE

Do not force the set collars tightly against the headframe. Verify that the pinion shaft will turn freely when the set collars are in place.

12. Align the grade potentiometer sprocket, then tighten its set screw.
13. Align the torque limiter and grade motor sprocket, then tighten the set screw on the torque limiter.
14. Reassemble the rack gear as described on page 4-12.
15. Replace the side bumper removed in Step 2.
16. Calibrate the grade potentiometer as described on page 4-20.
17. Test the treadmill elevation. Verify that:
    a. it operates over the full range of 0-25%.
    b. there is no binding when it moves up or down.
    c. the elevation pot chain is aligned correctly.
    d. the grade motor chain is also aligned correctly. A "popping" sound in the chain indicates that it is misaligned.
18. Unplug the treadmill and replace the hood.

WALKING DECK ASSEMBLY

Figure 4-19 is an overview of the walking deck assembly.

NOTE

Do not lubricate the walking deck (slider bed). It is not required.

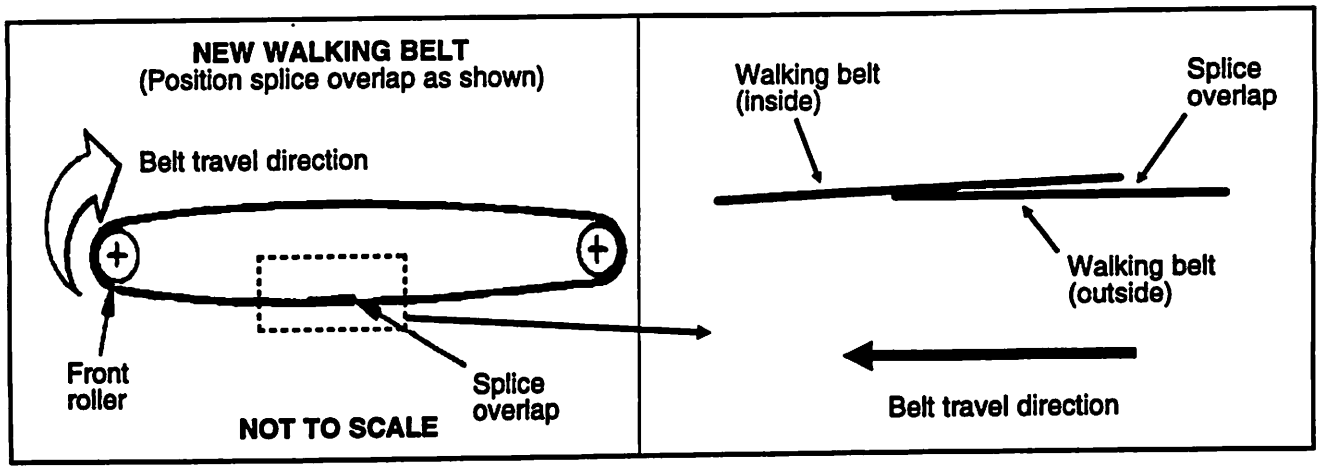


Figure 4-20. Walking Belt Splice Overlap Placement

Removing and Replacing the Front (Drive) Roller or the Idler (Rear) Roller

1. Remove the hood (page 4-1).
2. Remove the four Phillips screws that secure the rear roller guards, then remove the guards. Four wing nuts hold the screws in place on the underside of the treadmill, as indicated in Figure 4-19 on page 4-15.
3. Remove both end caps, located on either side of the belt at the rear of the walking platform.
4. Remove the trim strips from the siderail covers, then loosen the six set screws (three per side) that secure the plastic siderail covers to the siderails.
5. Slide the siderail covers back off the treadmill.
6. Remove the four 1/2" hex screws and nuts (two on each side) that secure the two front drive roller retainers to the frame siderail. One retainer is on each side of the drive roller assembly.
7. Slide the drive roller assembly to the left, then remove the timing belt from the right side of the roller.
8. Lift the roller assembly out from under the walking belt.
9. Pull the walking belt towards the rear of the deck, then slide the rear roller assembly out from between the siderails toward the *rear* of the treadmill.
10. Replace the rollers and reassemble the treadmill following Steps 1-8 in reverse order.
11. Adjust the walking belt tension following the procedure on page 4-17.
12. Adjust the walking belt tracking following the procedure on page 4-18.
13. Verify that the gap between the rear roller guards and the rear roller is no more than 3/8". Adjust if necessary following the procedure on page 4-19.

Replacing the Walking Belt

NOTES

- All orientations are given as if you were walking on the treadmill.
- A new slider bed is recommended when you install a new walking belt.

1. Unplug the treadmill and remove the treadmill hood (page 4-1).
2. Remove the two hex socket head screws which secure the right side bumper to the treadmill siderail, then remove the bumper.
3. Remove the left bumper as in Step 2.
4. Remove the front and rear roller assemblies as described on this page.
5. Place blocks to the right of the headframe and deck to prevent damage.
6. Carefully place the treadmill on its right side on the blocks.

7. Remove the drive pulley bottom cover:
   a. Loosen, *but do not remove,* the four screws which mount the cover to the headframe. Two screws secure the motor, and two are in the head frame.
   b. Remove the two hex nuts which secure the cover to the deck frame.
   c. Remove the cover.
8. Use a 9/16" wrench to remove the two screws holding the walking deck frame to the left side of the headframe (Figure 4-19).
9. Slide the walking belt off by working the belt between the walking deck frame and the headframe.

NOTE

When you install a new belt, verify that the closed end of the splice on the walking belt hits the roller *first* as the belt rotates. See Figure 4-20 on page 4-16.

10. Install a new belt and reassemble the treadmill following Steps 1-9 in reverse order.
11. Tension the belt as described on this page.
12. Adjust belt tracking following the procedure on page 4-18.

Removing the Slider Bed

1. Remove the front and rear roller assemblies as described on page 4-16.
2. Remove the eight or 10 Phillips screws securing the slider bed, then slide the slider bed from underneath the walking belt to remove it.

NOTE

The two front screws also attach the drive pulley cover underneath the treadmill.

3. To replace the slider bed, follow Steps 1-2 in reverse order.
4. Tension the belt following the procedure on this page.
5. Adjust the belt tracking following the procedure on page 4-18.
6. Verify that the gap between the rear roller guards and the rear roller is no more than 3/8". Adjust if necessary.

WALKING BELT ADJUSTMENT PROCEDURES

Walking Belt Tension

Adjust the walking belt tension:

- whenever the belt slips or moves unsteadily during operation.
- after installing a new walking belt.
- each time you remove or replace the walking belt.
- whenever specified in the procedures in this Section.

Two adjustment methods are specified. Method 1 is preferred, but two belt tension calipers (Quinton p/n 030113-001) are required.

NOTE

Both adjustment screws must be completely slack before starting this procedure.

Method 1 (Calipers available)

1. Press **POWER** to turn the treadmill off, then disconnect the treadmill power cord from the outlet.
2. Thread both tension adjustment screws in until most of the slack is removed from the walking belt (Figure 4-21).

NOTE

Do not stretch the belt at this point.

3. Position one caliper on each side of the belt, approximately 18" from the rear roller assembly.
4. Grasp the belt with one caliper clamp.
5. Pull the slack between the clamps out of the belt with your fingers, then grasp the belt with the second clamp.

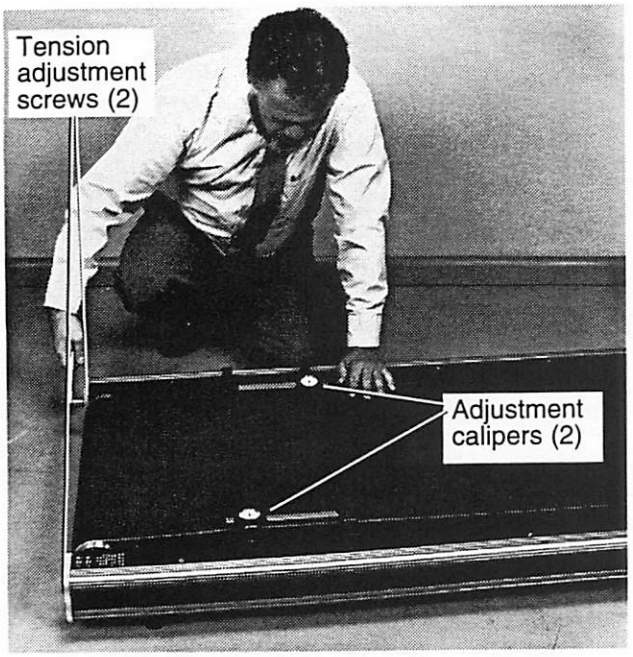


Figure 4-21. Adjusting Walking Belt Tension

6. Repeat Steps 4 and 5 on the other side of the belt using the other caliper.
7. Zero out the dials of both calipers.
8. Alternately tighten each tension adjustment screw in 0.1% increments until both sides read 0.4%. *Ensure that the pointer reads **exactly** on the line increment of the dial for each setting.*

CAUTION

Do not overtighten the adjustment screws. Overtightening may damage the walking belt and roller assemblies.

9. Remove both gauges.
10. Adjust the walking belt tracking following the procedure on this page.

Method 2 (Calipers not available)

NOTE

Both adjustment screws must be completely slack before starting this procedure.

Use this method only if two belt adjustment calipers are not available. However, an accurate measuring device is required.

1. Press **POWER** to turn the treadmill off, then disconnect the treadmill power cord from the outlet.
2. Thread both tension adjustment screws in until most of the slack is removed from the belt. Figure 4-21 shows where the screws are located.

NOTE

Do not stretch the walking belt at this point.

3. Place two pieces of masking tape or two light pencil marks on the right edge of the belt exactly 50.000" apart.
4. Repeat Step 3 on the left edge of the belt.
5. Alternately turn the left and right adjustment screws one-half turn each time until the distance between the tape (or pencil marks) is 50.203" ±0.016" on both sides.

CAUTION

Do not overtighten the adjustment screws. Overtightening may damage the walking belt and roller assemblies.

6. Remove the tape, if used in Step 3.
7. Adjust the walking belt tracking following the procedures described below.

Walking Belt Tracking

Perform this procedure:

- whenever the belt moves to one side or the other.
- after installing a new walking belt.
- each time you remove or replace the walking belt.
- each time you adjust the walking belt tension.
- whenever specified in the procedures in this Section.

Stay off the belt when adjusting the tracking.

1. Tension the walking belt using either Method 1 or Method 2 in the previous paragraph.

WARNING

Do not start the treadmill when someone is on the walking belt. The belt starts moving immediately, and the sudden start and subsequent loss of balance could cause serious personal injury.

2. Start the treadmill and let it run for at least one minute at minimum speed and grade.
3. Make the following adjustment to the *right adjustment screw only:*
   a. If the belt moves to the *right*, turn the screw 1/4 turn *clockwise.*
   b. If the belt moves to the *left*, turn the screw 1/4 turn *counterclockwise.*

   Figure 4-21 shows the location of the adjustment screws.
4. After making an initial adjustment, run the treadmill for at least one minute to observe how the belt tracks. Adjustments to belt tracking take some time to become apparent.
5. Repeat Steps 3 and 4 as required.

CAUTION

Do not overtighten the adjustment screw. Overtightening may damage the walking belt and assemblies.

6. Increase the speed to 8 mph, then repeat Steps 3 and 4 as required.
7. Press **STOP BELT** to stop the treadmill, then press **POWER** to turn it off.
8. Disconnect the treadmill power cord from the outlet.
9. Check the gap between the rear roller guards and the rear roller following the rear roller guard adjustment procedure described on this page.

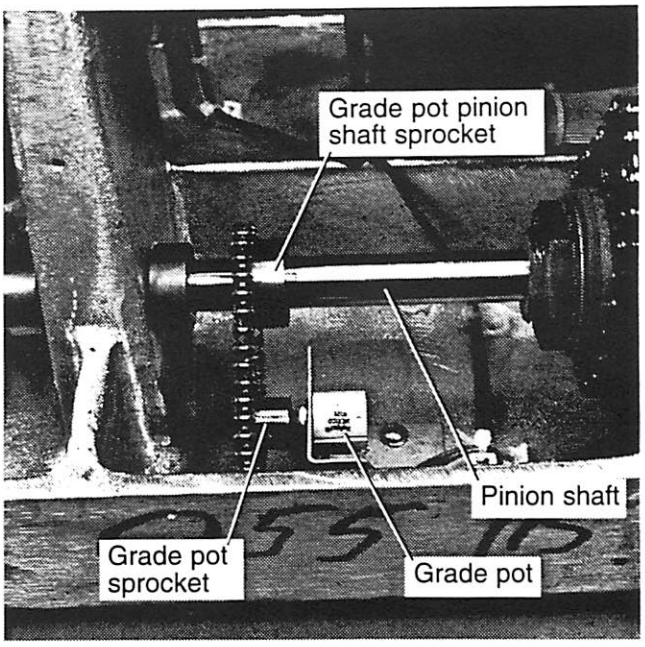


Figure 4-22. Grade Pot and Pinion Shaft

Rear Roller Guard Adjustment

WARNING

Disconnect the power cord from the AC power source before performing this procedure.

Check the position of the rear roller guards each time you adjust the belt tracking or belt tension. The roller guards are located at the rear of the treadmill between the rear roller and the slider bed (Figure 4-19). The gap should be no more than 3/8".

1. Verify that the power cord is disconnected from the wall socket.
2. Measure the gap between the roller guards and the rear roller.
   a. If it is 3/8" or less, no adjustment is required.
   b. If it is greater than 3/8", go to Step 3 to adjust it.
3. Loosen, *but do not remove,* the two screws attaching the rear roller guard to the treadmill deck. Hold the nuts on the underside so they do not fall off.
4. Slide the rear roller guard toward the rear roller until the gap between the two is approximately 1/8" inch.
5. Tighten the screws loosened in Step 3.

CALIBRATION PROCEDURES

Grade Potentiometer (Pot) Calibration

Calibrate the grade pot whenever specified in the procedures in this Section. Figure 4-22 on page 4-20 shows the location of the pot.

1. Remove the hood (page 4-1).

WARNINGS

- ***Do not wear loose clothing around rotating machinery.***
- ***Keep fingers away from chains and rotating parts.***
- ***High voltage is present when the treadmill is plugged in.***

2. Restore power to the treadmill.
3. Lower the elevation until the torque limiter spins against the lower mechanical stop without changing the grade. This is the minimum grade.
4. Kneel in front of the treadmill, then loosen the set screw which secures the grade pot sprocket to the pinion shaft (Figure 4-22).
5. Rotate the sprocket away from you until it stops, then rotate it back ½ turn towards you.
6. Tighten the set screw you loosened in Step 4.
7. Elevate the treadmill until it reaches maximum grade. Make sure that the grade pot spins freely during elevation. There should be no evidence of mechanical binding throughout the grade change.
8. Calibrate the grade feedback following the procedure in the next paragraph.

Grade Feedback Calibration

Calibrate the grade feedback when you:

- replace the treadmill PCB Assembly, or
- calibrate the grade pot.

1. If necessary, remove the hood (page 4-1).

WARNINGS

- ***Do not wear loose clothing around rotating machinery.***
- ***Keep fingers away from chains and rotating parts.***
- ***High voltage is present when the treadmill is plugged in.***

2. Restore power to the treadmill.
3. If a programmable controller such as a 645 or Q4000 is used, place it in *open loop mode* before continuing. Refer to the Manual for the specific controller. (On the 645 Controller, the **CAL** LED should be illuminated.)
4. Decrease the treadmill grade to the lower mechanical stop, then raise the treadmill grade ¼".
5. Adjust potentiometer R87 on the PCBA until the grade (elevation) display on the controller reads **0.2.**
6. Lower the treadmill to the mechanical stop and verify that **0.0** appears on the grade display.
7. Raise the grade to the upper mechanical stop.
8. Adjust R105 on the PCBA until the grade display reads **25.2.**
9. Lower the treadmill to the mechanical stop and verify that **0.0** appears on the grade display. Adjust R87 if necessary.
10. If you have replaced the PCB Assembly, perform the speed feedback calibration in the next paragraph. Otherwise, remove power to the treadmill and replace the hood.

Speed Feedback Calibration

When a new PCB Assembly is installed, you must:

- determine walking belt speed.
- calibrate the speed display.
- set the threshold speed.
- set the maximum and minimum speed.

When the user presses STOP BELT when the belt is traveling above the threshold speed, the speed change motor performs a high speed deceleration to slow the treadmill down to the threshold speed, then stops. Below the threshold speed, the treadmill stops without the high speed deceleration.

Read the warnings on this page before calculating belt speed or calibrating speed feedback.

Measuring Walking Belt Speed

To determine the belt speed, use one of the following methods:

Method 1. Attach the positive lead of a frequency counter to JP5-1, and the negative lead to TP4 (ground). Their locations are shown in Figure 4-23 on page 4-22. This reads the pulse counts from the treadmill's tachometer, which increases linearly with belt speed. (Remove the counter when you have determined the speed.)

69.67 Hz corresponds to 1 mph.

Method 2. Hold a tachometer against the exposed (right) end of the output shaft. The treadmill speed is:

Speed (mph) = Tachometer RPM / 209.

Method 3. Hold a tachometer with a 6-inch circumference roller against the walking belt.

Speed (mph) = Tachometer RPM / 176.

Method 4. Measure the belt circumference and count the belt revolutions in one minute. This is the least accurate method, but no tachometer is required. The treadmill should be running at a moderate speed while you are counting the revolutions. Note that measurement, timing, and counting errors will all be reflected in the calculated speed.

Speed (mph) = C X RPM / 1056

where C = walking belt circumference in inches.

- For the Q50, C = 115" (approximately)
- For the Q55 or Q55XT, C = 125"
- For the Q65, C = 145"

Calibrating the Speed

This procedure is easier to perform from the left side of the headframe. The hood should be removed and there should be power to the treadmill.

Read the warnings on page 4-20 before continuing this procedure.

NOTES

1) If you are using an automatic treadmill controller such as the Quinton Model 645 or the Q4000, you must place it in the *open loop mode* for this procedure. Refer to the manual for your controller.

2) The 640 controller, which does not have an open loop mode, will not update the speed display when you adjust R128 (in step 4) until you tap the Speed Increase or Speed Decrease button. Tap either key quickly to update the display after you have adjusted R128, and be sure to verify the treadmill speed before making the final adjustment to R128.

1. Locate switch SW1 on the PCBA, then set SW1-1, SW1-3, and SW1-4 to the ON position (Figure 4-23 on page 4-22).

To calibrate the *speed display*:

2. Increase the speed to 6.0 mph or above.
3. Determine the belt speed using one of the methods descibed on this page.
4. Adjust pot R128 on the PCBA until the speed display is correct according to your calculations. Turn the pot counter-clockwise to increase the value on the display.
5. Use the calibrated display speed for the remainder of this procedure.

To set the *threshold speed:*

6. Decrease the treadmill speed to the threshold speed for the treadmill. Refer to column 2 in Table 4-1 on page 4-23.
7. Adjust potentiometer R88 counter-clockwise until LED DS3 illuminates fully.

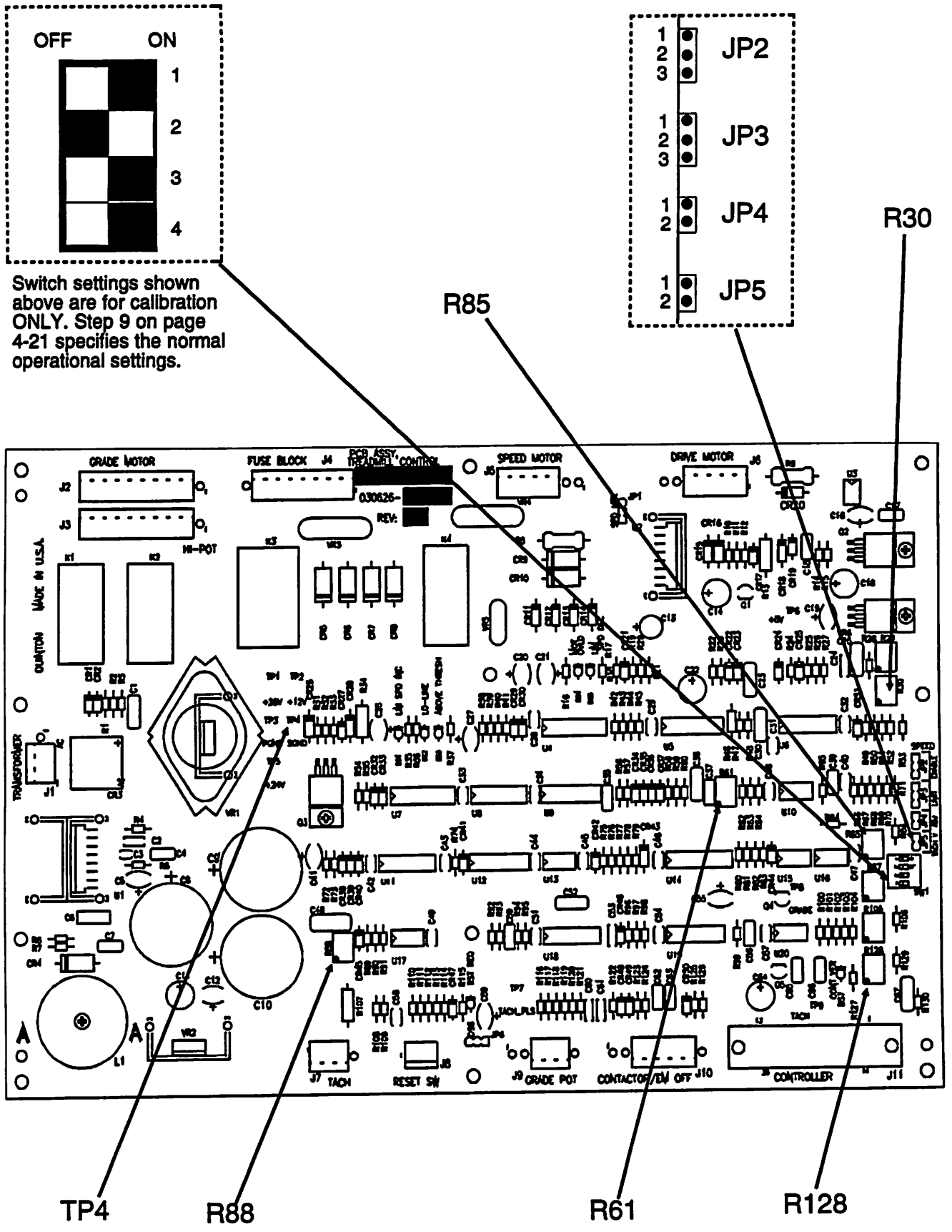


Figure 4-23. PCBA, showing Switches, Jumpers, and Pots

Table 4-1. Speed Adjustments (mph)

Speed Range (mph)	Threshold Speed (mph)	Maximum Speed Setpoint (mph)	Minimum Speed Setpoint (mph)	Speed Window (mph)
0.6-6.0	0.9	6.2	0.5	0.5-6.5
0.8-8.0	1.0	8.2	0.7	0.7-8.5
1.0-10.0	1.4	10.2	0.9	0.9-10.5
1.2-12.0	1.6	12.2	1.1	1.1-12.5
1.5-15.0	2.0	15.2	1.3	1.3-15.5

8. Adjust R88 clockwise until DS3 is completely extinguished.
9. Reset SW1-1, SW1-3, and SW1-4 on switch SW1 to the OFF position.

To set the *maximum speed:*

10. Increase the speed to the value listed in Table 4-1, column 3. If the treadmill will not reach this speed, adjust pot R85 clockwise until it does.
11. Adjust R85 until LED DS1 just illuminates. This sets the maximum electronic speed limit.
12. Verify that the speed is limited electronically at the maximum rated speed.

To set the *minimum speed:*

13. Decrease the speed to the value listed in Table 4-1, column 4. If the treadmill will not reach this speed, adjust pot R30 1-2 turns clockwise until it does.
14. Adjust R30 counter-clockwise until LED DS5 just illuminates. This sets the minimum electronic speed limit.
15. Verify that the speed is limited electronically at the minimum rated speed.
16. Watch the speed display while you increase the speed to the electronic maximum. The displayed speed should not change more than 0.2 mph at a time. (If the speed approaches the limit too rapidly, it may overshoot the electronic limit because of the inherent delay in the feedback circuitry.)
17. If the display changes too rapidly or if the treadmill overshoots its maximum rated speed, adjust pot R61 counter-clockwise, then repeat step 16. Verify that the treadmill does not overshoot its maximum speed rating.

NOTE

The adjustment in Step 17 prevents "hunting" for the speed setpoint (i.e. the displayed speed). If R61 is not adjusted correctly, the speed may increase and decrease continuously around the setpoint during use, particularly at high speeds.

18. Verify that the treadmill speed range is as specified in Table 4-1, column 1:
    a. Increase the treadmill to maximum speed.
    b. Decrease it to minimum speed.
    c. Verify that the speed range falls within the speed window in Table 4-1, column 5.
19. Increase the treadmill speed above the threshold speed in Table 4-1, column 2, then press **STOP BELT**. Verify that a high-speed deceleration occurs before the treadmill shuts off.
20. Press **START BELT** and verify that the walking belt starts at or below the appropriate threshold speed (Table 4-1, column 2).
21. Press **STOP BELT**, then remove power from the treadmill

ADJUSTMENT PROCEDURES

V-Belt Adjustment

The V-belt connects the drive motor to the input shaft assembly (Figure 4-24). Perform this adjustment procedure:

- each time you replace the V-belt with a new one.
- if the V-belt squeaks during treadmill operation.

NOTE

Place a clean sheet of cardboard or a clean rag on the treadmill deck before starting this procedure.

1. Remove the hood (page 4-1).
2. Remove cable ties that secure the drive motor wires.
3. Remove one clamp from either side of the drive motor that secure it to the motor base plate.
4. Slip the V-belt off the motor pulley, then lift the drive motor off the base plate. Set it down carefully on the walking deck.
6. Use a pencil to scribe a line along the edge of the motor base place which is closest to you. The angle between the line and the edge of the headframe casting *must be maintained for correct belt alignment.*
7. Loosen, *but do not remove,* the four 7/16" hex-head screws which secure the motor mounting base to the headframe location.

NOTE

In the following step, move the base in 1/8" increments, and maintain the angle described in Step 6.

8. Adjust the belt in 1/8" increments as follows:

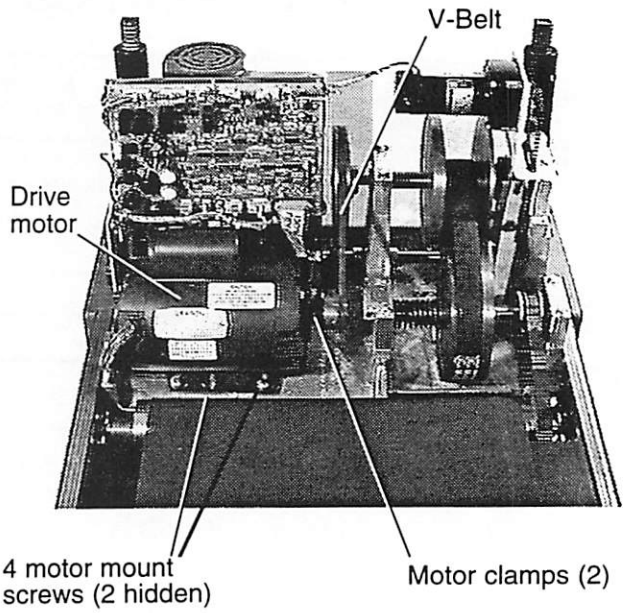


Figure 4-24. Drive Motor

   a. To *loosen* the belt, move the motor mounting base *towards* the front of the treadmill.
   b. To *tighten* the belt, move the motor mounting base *away from* the front of the treadmill.
9. Tighten all four screws.
10. Place the drive motor on the motor base, then loop the V-belt over the motor pulley and the input shaft pulley.
11. Install the motor clamps, then tighten securely.
12. Check the belt alignment to verify that the motor base is fastened correctly. Adjust if necessary.
13. Replace the treadmill hood (Page 4-1).

Torque Limiter Adjustment

The torque limiter adjustment nut clamps the torque limiter friction pads to the elevation sprocket, which is connected to the grade motor. If the pads are worn, the nut may need to be tightened.

1. Remove the hood (page 4-1).

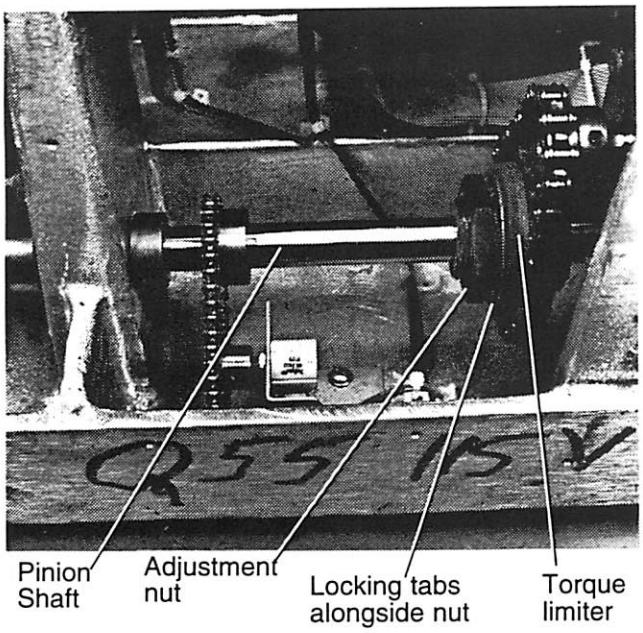


Figure 4-25. Torque Limiter, Adjustment Nut, and Tabs

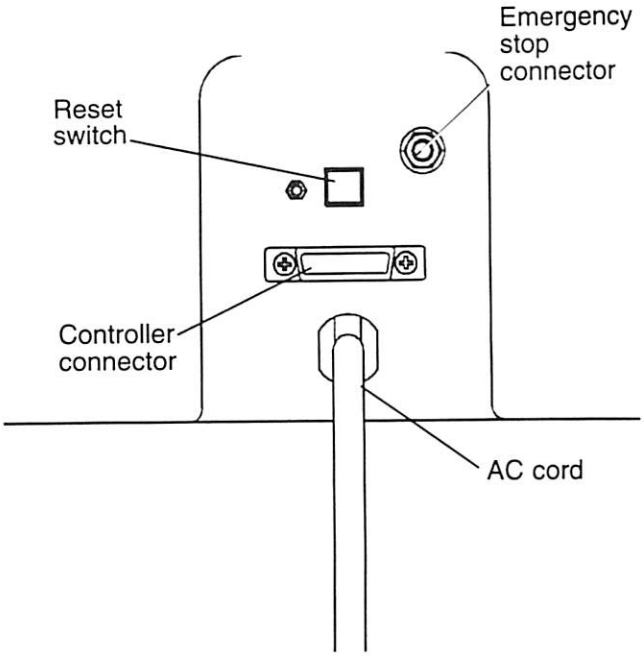


Figure 4-26. Reset switch and connectors

WARNINGS

- ***Do not wear loose clothing around rotating machinery.***
- ***Keep fingers away from chains and rotating parts.***
- ***High voltage is present when the treadmill is plugged in.***

2. Restore power to the treadmill.
3. If a programmable controller such as a 645 or Q4000 is used, place it in *open loop mode* before continuing. Refer to the Manual for the specific controller. (On the 645 Controller, the **CAL** LED should be illuminated.)
4. Bend the locking tabs away from the torque limiter adjustment nut. It may be necessary to operate the grade motor in order to access all tabs (Figure 4-25).
5. Run the treadmill elevation down to the lower stop.
6. Press the grade down to run the elevation against the lower stop, then release.

WARNING

The treadmill must be at 0% grade when you loosen the torque limiter adjustment nut. Loosening the nut when the treadmill is elevated can cause the treadmill to drop suddenly, which may result in serious injury.

7. Use locking pliers to tighten the torque limiter adjustment nut until the motor hesitates when it is started while the treadmill is against the lower stop. 1/8 turn is generally sufficient. *Do not overtighten the nut!*
8. Loosen the nut until the motor just stops hesitating when it is started.
9. Stand on the walking deck and elevate the treadmill to verify that it will reach its upper limit (25%). If possible, two people should stand on the deck.
10. Lower the elevation to 0%, then bend at least 3 locking tabs on three different surfaces over the adjustment nut (Figure 4-25).
11. Remove power to the treadmill, then reinstall the hood (page 4-1).

REPLACING THE POWER CORD

Figure 4-26 on page 4-25 shows the location of the power cord and reset switch.

1. Unplug the treadmill from the power source.
2. Remove the hood (page 4-1).
3. Disconnect the power cord ground wire from the headframe. Note the order in which the washers stack up.
4. Disconnect the power cord leads from the terminal block. Note the connection points.
5. Cut the cable ties that secure the power cord leads to the wire harness.
6. Use pliers to squeeze the strain relief that holds the power cord to the mounting plate, then remove the cord.
7. Install a new power cord and strain relief following Steps 1-6 in reverse order. Be sure that the cord has the correct voltage and amperage rating.

REPLACING THE RESET SWITCH

1. Unplug the treadmill from the power source.
2. Remove the hood (page 4-1).
3. Disconnect the reset switch wires from connector J8 on the PCB Assembly, then cut the cable ties securing them to the wire harness.
4. Push the reset switch out from the back of the mounting plate. The switch fits tightly, so you may need to rock it up and down to loosen it.
5. Push the new switch straight into the hole until it is firmly seated.
6. Plug the connector into J8 on the PCB Assembly, then use cable ties to secure the wires to the harness.
7. Install the treadmill hood.

CLEANING THE TREADMILL SURFACES

Clean the treadmill after servicing or as needed:

- Clean the treadmill exterior with a damp sponge. Do not use detergents or cleaning agents.
- Clean the control panel with a mild non-abrasive liquid cleaner, then rinse it with a damp (not wet) cloth.

NOTE

Do not lubricate the surface of the treadmill deck (slider bed).

SECTION 5 TROUBLESHOOTING

This Section consists of several tables that isolate most problems that could occur during treadmill operation, and provide a variety of suggestions for onsite repair. The tables include:

1. mechanical noises.
2. LED codes for the 640 controller.
3. fuses on the PCB Assembly.
4. LEDs, jumper points, and test points on the PCB Assembly.
5. connectors and jumper points.
6. power-up problems.
7. speed change problems and belt not moving.
8. elevation problems.
9. speed and grade feedback problems.
10. walking belt not tracking correctly.
11. belt slippages.

In addition, this Section includes a discussion of troubleshooting techniques for bearing problems.

TROUBLESHOOTING BEARING PROBLEMS

WARNING

Observe the following precautions when servicing the treadmill:

- **Do not start the walking belt when someone is on the treadmill. The belt starts moving immediately, and the sudden start and subsequent loss of balance could cause serious personal injury.**
- **High voltage is present when the treadmill hood is removed and the treadmill is plugged in.**
- **Do not wear loose clothing around rotating machinery.**
- **Never place your fingers near rotating parts.**

All bearings are sealed and permanently lubricated, so maintenance is not required. The following information is provided to assist in diagnosing and trouble-shooting bearing failures.

Most failures cause clicking or knocking noises that are heard during treadmill operation. Determining the type and the rate of bearing noise can help establish which bearing is at fault. Table 5-1 on page 5-2 is a diagnostic summary of bearing noises, along with other noises that may indicate problems.

- *Transmission bearings* generally click when they fail.
  - The *input shaft assembly* rotates at a constant speed, so the rate of the bearing noise (i.e. the number of clicks per minute) remains constant regardless of the walking belt speed.
  - The speed of the *output shaft assembly* varies with the treadmill speed, so the rate of the bearing noise (i.e. the number of clicks per minute) increases or decreases along with the walking belt speed.

- Front and rear *roller assembly bearings* tend to knock when they fail. (There are exceptions, however.) Also, the rate of the bearing noise (number of knocks per minute) varies with treadmill speed, because the roller speeds increase or decrease as belt speed changes.

A stethoscope with an open or tube end, or a piece of hose about two feet long, is useful for isolating bearing problems. (Hold one end of the hose near the suspected bearing, and the other end near your ear.) Compare several bearings to determine the sound of a faulty one. *Read the warning on this page first before attempting this!*

Table 5-1. Troubleshooting Mechanical Component Noises

NOISE	PROBABLE FAULTY COMPONENT	ACTION
Clicking (Constant speed)	Input shaft assembly transmission bearing	Isolate bearing, then replace input shaft assembly (page 4-6)
Clicking (Rate increases/ decreases with walking belt speed)	Output shaft assembly transmission bearing	Isolate bearing, then replace output shaft assembly (page 4-8)
Knocking or thumping (Rate increases/decreases with walking belt speed)	Front or rear roller (pulley) assembly bearings	Isolate and replace roller [pulley] (page 4-16)
High-pitched "singing"	Final drive belt too loose or too tight	Adjust belt tension (page 4-10)
Squealing (like loose automobile fan belt)	Motor belt (V-belt) loose	Adjust belt tension (page 4-24). Replace belt if necessary.
Popping (during grade increase or decrease)	Faulty elevation chain alignment	Adjust alignment of sprockets

Table 5-2. LED Codes for the Model 640 Controller

LED	FAULT INDICATION	ACTION
ADJUST BELT TRACKING	(Not used)	———
MOTOR OVERLOAD	Motor overload when ILLUMINATED (ON)	1. Press **STOP**, followed by **RUN** to turn off LED, or cycle AC power at the treadmill circuit breaker. 2. If L1 remains lit, check the walking belt amd deck surface for excessive wear. Replace if necessary.
LOW POWER	Low power when ILLUMINATED (ON)	Indicates that AC line voltage has dropped 15% or more below nominal. Check line voltage at AC outlet.
DISCONNECTED CABLE	Cable partially disconnected when ILLUMINATED (ON)	Indicates that the cable between the treadmill and the Model 640 controller is mproperly connected. Verify connection and reattach or replace as required.

Table 5-3. Fuses for 208/230 Volt Treadmills

FUSE	RATING	FUNCTION
F1 & F2*	3.2 Amp, 250 V Slow-blow	Grade motor
F3 & F4*	0.7 Amp, 250 V Slow-blow	High-speed deceleration circuitry for speed change motor
F5 & F6*	0.5 Amp, 250 V Slow-blow	Transformer

Fuses for 115 Volt Treadmills

FUSE	RATING	FUNCTION
F1 & F2*	6.25 Amp, 250 V Slow-blow	Grade motor
F3 & F4*	0.7 Amp, 250 V Slow-blow	High-speed deceleration circuitry for speed change motor
F5 & F6*	1.0 Amp, 250 V Slow-blow	Transformer

WARNING: High voltage may be present on fuses. Unplug treadmill before replacing any fuse.

*NOTE: If one fuse of a pair is blown, replace *both* fuses.

Table 5-4. LEDs on Treadmill PCB Assembly

LED	FUNCTION
DS1	Lights when upper speed limit is reached
DS2	Lights when a "low-line" voltage condition is detected
DS3	Lights when treadmill speed is above the high-speed deceleration threshold
DS4	Lights when a "drive-motor overload" condition has occurred
DS5	Lights when lower speed limit is reached
DS6	Lights when the RESET switch needs to be pressed
DS7	Lights when a controller such as the 640 is connected to the treadmill

Table 5-5. Connectors and Jumper Pins

CONNECTOR	PIN(S)	FUNCTION
JP1		Normal speed-change motor voltages
	1	Pulse-width modulated +28 V when Speed Decrease is active
	2	Voltage proportional to the speed change motor current (V = 0.51 x I)
	3	Pulse-width modulated +28 V when Speed Increase is active
JP2		Speed change contour circuitry
	1	Speed contour input
	2	Contour output
	3	Torque contour input
JP3		Electronic speed limits
	1	Low-speed limit voltage (approx +5.4 V)
	2	Speed feedback voltage
	3	High-speed limit voltage (approx +10.1 V)
JP4		Speed-change commands
	1	High (+12 V) when the controller sends a Speed Decrease command while the walking belt speed is *faster* than the low-speed limit.
	2	High (+12 V) when the controller sends a Speed Increase command while the walking belt speed is *slower* than the high-speed limit.
JP5		Tachometer pulses
	1	+12 V and 0V (pulsed). Frequency is proportional to walking belt speed.
	2	Ground (0 V)
JP6		Emergency-off switch jumper
	1-2	Normal operation: the walking belt stops without a high-speed deceleration when the user presses the Emergency Off switch (This also causes the RESET switch to light up.)
	2-3	Undefined operation: Normal stop occurs (including high-speed deceleration) when the user presses the Emergency Off switch.

Table 5-6. Voltage Test Points on PCB Assembly

TEST POINT	EXPECTED VOLTAGE*	FUNCTION
TP1	+28 V	+28 V power supply
TP2	+12 V	+12 V power supply
TP3	0 V	Power ground (0 V)
TP4	0 V	Signal ground (0 V)
TP5	+23 V	+23 V power supply
TP6	+5 V	+5 V power supply
TP7	+12 V and 0 V (pulsed)	Tach pulses: negative-going 0.3 msec pulses with a frequency proportional to the speed of the walking belt.
TP8	+0.5 V at 25 % +11.5 V at 0%	Grade: DC voltage inversely proportional to the treadmill grade.
TP9	+8.6 V at 15 mph +12 V at 0 mph	DC voltage inversely proprortional to the walking belt speed. [Derived from filtered and scaled tachometer pulses.]

*All voltages DC unless otherwise indicated.

Table 5-7. Treadmill Does Not Power Up

POSSIBLE PROBLEM	ACTION
Treadmill not plugged in	Plug power cord into an appropriate outlet.
AC Mains (building) circuit breaker tripped	Contact building maintenance to reset breaker. If breaker trips again: 1) Verify that treadmill is on a dedicated line. 2) Check voltage at outlet. If necessary, verify that rated power at outlet and at breaker is sufficient to operate treadmill. 3) Verify that power cord is not caught in rack gear.
Power cord cut or damaged	Remove cord from outlet and replace.
Fuse in treadmill blown	Remove power cord from wall outlet and replace fuse (Table 5-3). If fuse blows again, isolate mechanical assembly and ensure that no parts are jammed (e.g. rack gear in grade change assembly.)
Control cable between treadmill and controller disconnected at either end.	Check both plugs and connectors. Reconnect and tighten screws as required.
Control cable (including connector pins) between treadmill and controller faulty	Check for bent or broken pins. Replace control cable.
Treadmill PCB Assembly failure	Check power supply power at test points (Table 5-6). If power is *incorrect*, replace PCB Assembly.
Controller problem	Repair or replace controller as required

Table 5-8. Treadmill Does Not Change Speed

POSSIBLE PROBLEM	ACTION
Speed change relays on PCBA not operational	Replace treadmill PCBA
Speed change motor burned out or not operational	1) Verify that motor can rotate (i.e. is not jammed) 2) Test voltage from filter to motor. It should range from 0-28 V (maximum) during normal speed change. Replace motor if required.
Wires poorly connected to (or disconnected from) speed change motor terminals	Crimp terminals and reconnect wires as required.
Speed change motor brushes worn	Check brushes. Replace as required.
Speed change spindle jammed	Remove and replace spindle assembly (Refer to Input Shaft Removal, Section 3)
Input shaft assembly moveable sheave jammed	Remove and replace input shaft assembly
Output shaft assembly moveable sheave jammed	Remove and replace output shaft assembly

Table 5-9. No High-Speed Deceleration

POSSIBLE PROBLEM	ACTION
Fuse F3 or F4 blown.	Isolate problem, then replace fuse(s) with one of same rating.
Loose connection to isolation transformer.	Check all connections and tighten as required.

Table 5-10. Treadmill Powers Up, but Belt Does Not Move

POSSIBLE PROBLEM	ACTION
RESET button (on hood) lit.	Ensure nobody is on walking belt, then press RESET button.
Contactor not operational.	Verify that wires are connected, then check power supply voltages). Replace contactor as required.
Drive motor overheated or not operational.	Check voltage from contactor to motor. Replace motor if required.
Wires to motor disconnected.	Reconnect wires as required.
Motor noise audible, but walking belt not moving.	Replace broken motor belt.
RESET button illuminated, but: 1) stays lit when pressed, and 2) belt does not move	Short in Emergency Off switch. 1) Remove switch and verify correct operation. 2) Replace Emergency Off switch as required.

Table 5-11. Treadmill will not change grade

POSSIBLE PROBLEM	ACTION
Grade change motor burned out or not operational	Test motor. Replace if required.
Wires poorly connected to (or disconnected from) terminals	Crimp terminals and reconnect wires as required.
Rack gear jammed	Check and free gear (page 4-13)
Torque limiter too loose	Readjust limiter and tighten nut (page 4-24)
Fuse F1 or F2 blown	Isolate problem, then replace fuse(s) with one of same rating.

Table 5-12. Grade Feedback Problem: Display Varies from Actual Grade

SYMPTOMS	POSSIBLE PROBLEM	ACTION
Grade does not change from 0%	1) J9 disconnected 2) Defective grade pot	1) Reconnect J9 2) Replace grade pot
Display does not change from a value *other than 0%.*	Defective grade pot	Replace grade pot
Minimum grade reading not 0% OR Maximum grade reading not 25.2%	Feedback out of adjustment	Calibrate grade as described in Section 4, page 4-20

Table 5-13. Speed Feedback Problem: Display Varies from Actual Speed

SYMPTOMS	POSSIBLE PROBLEM	ACTION
Display indicates speed greater than 20 mph when belt is started.	1) J7 disconnected 2) Defective tach assembly	1) Reconnect J7 2) Replace tach assembly
Display suddenly indicates speed greater than 20 mph when treadmill is in use	Defective tach assembly	Replace tach assembly
Speed readings too high or too low	Feedback out of adjustment	Calibrate speed as described in Section 4, page 4-21

Table 5-14. Walking Belt Slipping or Not Tracking

POSSIBLE PROBLEM	ACTION
Walking belt slipping	Adjust belt tension (page 4-18) NOTE: Do not lubricate the surface of the treadmill deck (slider bed).
Belt not tracking:	
Tracking adjusted incorrectly	Adjust tracking (page 4-19)
Walking belt worn out	Replace belt (page 4-17)
Walking deck (slider bed) worn out	Replace deck (page 4-18)

Table 5-15. Internal Belt Slippages

SYMPTOMS	POSSIBLE PROBLEM	ACTION
1) Squealing sound like automobile fan belt, *and* 2) Walking belt slows down as user's foot strikes the deck	Motor drive belt (V-belt) slipping	Adjust belt tension or replace belt as necessary (page 4-23)
Walking belt slows as user's foot strikes the deck.	Transmission belt slipping	Check pulley sheaves for grease or oil. Clean as required.

SECTION 6 PART NUMBERS AND DRAWINGS

Table 6-1 on pages 6-1 and 6-2 lists the assembly drawings and schematics that are included in this Section. (The drawings appear in numerical order.) Refer to the assembly drawings for a complete list of treadmill parts.

Table 6-2 on page 6-3 lists the most commonly referenced part numbers for the treadmill and the Model 640 controller.

NOTE

Table 6-2 is for information only. Refer to the drawings included with this manual for specific part numbers when ordering replacement parts.

Table 6-1. Series 90 Drawing List

DRAWING NUMBER	DRAWING TITLE
000343	Final Assembly, Q55XTddd
000344	Final Assembly, Q65
000345	Final Assembly, Q50
000346	Final Assembly, Q55
013077	Tachometer Pickup Assembly
013089	Grade Pot Assembly
015273	Input Shaft Assembly
015313	Output Shaft Assembly
018351	Pulley (Roller) Assembly, Drive
018352	Pulley (Roller) Assembly, Rear
018533	PCBA, Model 640 Controller
018533-201	Schematic, Model 640 Controller PCBA
019089	Reset Switch Assembly
019130	Speed Change Motor Assembly
030262	Spindle Assembly, Speed Change
030626	PCB Assembly, Treadmill
030626-201	Schematic, PCB Assembly, Treadmill
030656	Drive Motor Assembly (Q55)
030657	Drive Motor Assembly, 200 V (Q55XT & Q65)
030658	Drive Motor Assembly, 230 V (Q55XT & Q65)
030665	Drive Motor Assembly, Q50
030669	Drive Motor Assembly, Q50
030736	Cordset, Power (International)
031193	Hood Assembly

Table 6-1. (Continued)

DRAWING NUMBER	DRAWING TITLE
031447	Input Shaft Assembly Spares Kit, Q55/Q50
031449	Input Shaft Assembly Spares Kit, Q65/Q55XT Q-Sport
031464	Power Relay
031474	Headframe Assembly (Q55XT, Q65)
031475	Headframe Assembly (Q50, Q55)
031476	Deck Assembly, Q50 & Q55
031477	Deck Assembly, Q65
031493	Transformer Assembly
031496	Mechanical Assembly (Q50)
031511	Contactor
031517	Mechanical Assembly (Q55XT)
031519	Grade Change Motor Assembly
031525	Mechanical Assembly (Q55)
031530	Mechanical Assembly (Q65)
031541	Strain Relief Plate Assembly (Domestic)
031554	PCBA Bracket Assembly (International)
031570	Cable Assembly, Interface
031571	Strain Relief Plate Assembly (International)
031602	Power Cord (Domestic)
031701	640 Controller, Top Assembly

Table 6-2. Commonly Referenced Part Numbers

NAME	PART NUMBERS	APPLICATION
Beam chopper	006875-001	All models
Belt, HTD	031107-004	Transmission to front roller (all models)
Circuit breaker, 2-pole	031396-003	European treadmills only
Contactor, AC power	031464-001	All models
Drive motor assembly	030648-49, 030656-59, 030661, 030664-65, 030669	Refer to drawings for specific part number for each model
Grade motor assembly	031519-001	208/230 V, 60 Hz
	031519-002	100/120 V, 60 Hz
	031519-003	230/240 V, 50 Hz
	031519-004	100/120 V, 50 Hz
Grade pot assembly	031089-002	All models
PCB assembly, treadmill	030626-001	All models
Power cord	031602, 030736	Refer to drawings for specific part number for each model
Pulley assembly, drive	018351-001	All models
Pulley assembly, rear	018352-002	All models
Reset switch	019089-001	All models
Slider bed (boxed for shipping)	032245-001	Q55
	032245-002	Q65
	032245-003	Q50
Speed change motor, 90 V	019130-002	USA/Japan
	019130-003	European
Speed change spindle assembly	030263-001	Replacement kit
Tacometer pickup assembly	013077-001	All models
Transmission input shaft assembly*	031447*	Replacement kit, Q50/Q55*
	031449*	Replacement kit, Q55XT/Q65*
Transmission output shaft assembly	015313-001	All models
V-Belt, motor to transmission	015241	Refer to drawings for specific part number for each model
Variable speed belt	013062-001	All models
Walking belt	018818-001	Q55
	018818-002	Q65
	018818-003	Q50
Interface cable, Model 640	031570-001	6 ft (2 m) length
Replacement assembly, Model 640	031701-002	USA
	031701-004	International

*Refer to the drawings in this Manual for the specific part and dash number.

INITIAL APPLICATION			REVISIONS			
DASH NO.	NEXT ASSY.	END ITEM No.	LTR	DESCRIPTION	APPROVED	DATE
-001 THRU -014	STDS	STDS	E	ADCN: 27859 UPDATED DRAWING ACTION CODE: H1 MOD: 9-20-93	F.RAMIREZ	9-2193

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON. IS APPROVED BY THE QUINTON DESIGN ENGINEERING DEPARTMENT IN THE APPLICATIONS SPECIFIED BY THIS DOCUMENT NUMBER. SUBSTITUTE ITEMS SHALL NOT BE USED.

UNIT OF MEASURE: EACH
ALL DIMENSIONS ARE IN MILLIMETERS AND ARE NOMINAL UNLESS OTHERWISE SPECIFIED.

1.0 DESCRIPTION: POWER CORDSETS FOR INTERNATIONAL APPLICATIONS.

PRODUCTION

TABLE 1

DASH No.	DESCRIPTION	MFG CODE	MFG PART NUMBER

PARTS LIST

SOURCE CONTROL DRAWING

CLASS CODE C O R A
VALUE CODE I N T L / /

Quinton instrument co.

2121 TERRY AVENUE
SEATTLE, WA. 98121
206/223-7373

(2)
PANEL COMPONENTS CORP
(1) SANTA ROSA, CA

APPROVED SOURCE(S) OF SUPPLY

DRAWN	F.RAMIREZ	4/16/92
CHECKED	C.MATHIS	6/27/92
ENGR.	A.NELSEN	6/30/92
MFG.	A.BELLAMY	7/1/92
Q.A.	C.JORDAN	7/1/92
PURCH.		

TITLE
CORDSET, INTERNATIONAL POWER

SIZE	DWG. NO.	REV
A	030736	E

SCALE NONE | SOURCE: ACAD | SHEET 1 OF 14

2.0 TABLE 1: MFG P/N.

DASH NO.	MFG NO. 1 (PANEL COMPONENTS)		
-001	86511052		
-002	86516034 86516060		
-003	86552007		
-004	86536041		
-005	86559011		
-006	86558011		
-007	86531031		
-008	86589010		
-009	86610300		
-010	86515050		
-011	98010801.10074.2		
-012	98010721.10074.2		
-013	98010871.10074.2		
-014	98010801.10074.1		

3.0 SPECIFICATIONS:

3.1 ELECTRICAL:

CURRENT RATING: -008 (JAPAN) = 15 AMPS
-011 & -014 (CONT. EUROPE) = 16 AMPS
-012 (UK) = 13 AMPS
-013 (ITALY) = 16 AMPS
-ALL OTHERS = 10 AMPS

VOLTAGE RATING: -008 (JAPAN) = 125 VAC
-009 (NORTH AMERICA) = 125 VAC
-ALL OTHERS = 250 VAC

3.2 MECHANICAL:

PLUG CONFIGURATION: PER TABLE 2.

END TERMINATION: PER TABLE 2.

NOMINAL CORD LENGTH: PER TABLE 2.

NOMINAL CORD DIAMETER: -008 (JAPAN) = 8.5mm
-009 (NORTH AMERICA) = .33 INCH
-001 THRU -007 & -010 = 7.0mm
-011 THRU -014 = 8.0 TO 9.8mm

CONDUCTORS: -008 (JAPAN) = 3 X 2mm
-009 (NORTH AMERICA) = 3 X 18AWG
-001 THRU -007 & -010 = 3X 1mm
-011 THRU -014 = 3X 1.5mm

3.3 CONDUCTOR COLOR CODES:

INTERNATIONAL:	NOTE: -009 (NORTH AMERICA) MAY BE.
BROWN = LINE	BLACK = LINE
BLUE = NEUTRAL	WHITE = NEUTRAL
GREEN/YELLOW = GROUND	GREEN = GROUND

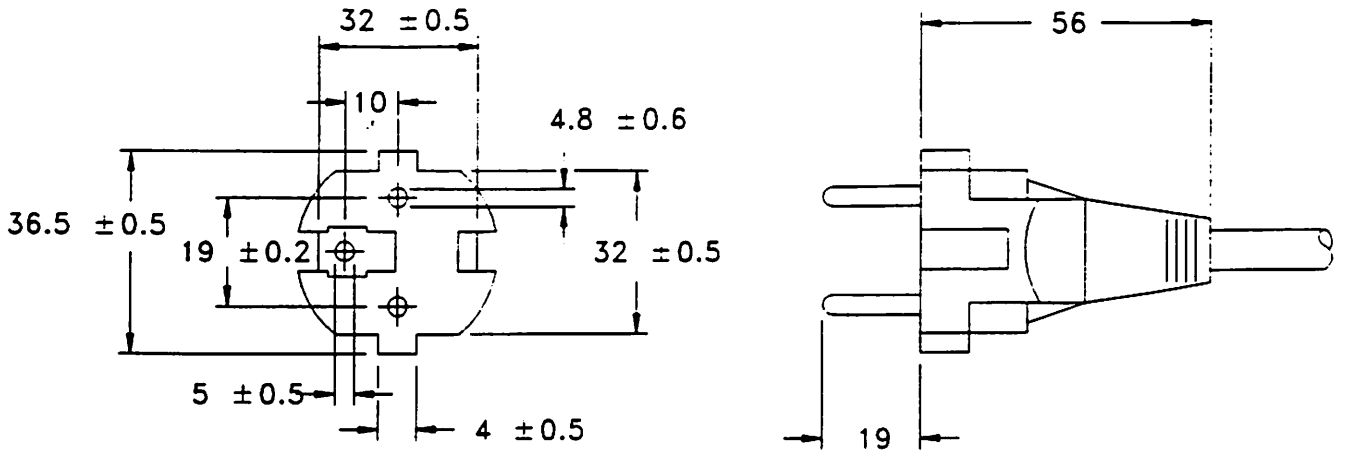
3.4 AGENCY APPROVALS: TABLE 2

	DASH NO.	COUNTRY	APPROVALS		LENGTH	PLUG (FIG)	END TERM (FIG)
			COUNTRY	AGENCY			
	-001	CONTINENTAL EUROPE	AUSTRIA BELGIUM FINLAND FRANCE GERMANY NETHERLANDS NORWAY SWEDEN	OVE CEBEC SETI UTE VDE KEMA NEMCO SEMCO	2.5m	1	11
1	-002	AUSTRALIA/ NEW ZEALAND	AUSTRALIA	SECV	3.0m	2A 2B	11
2	-003	U.K./IRELAND	UNITED KINGDOM	ASTA	2.5m	3	11
	-004	DENMARK	DENMARK	DEMCO	2.5m	4	11
	-005	INDIA	UNITED KINGDOM	BSI	2.5m	5	11
	-006	ISRAEL	ISRAEL	SII	2.5m	6	11
	-007	ITALY	ITALY	IMQ	2.5m	7	11
	-008	JAPAN	JAPAN	JIS/DENTORI	2.4m	8	11
1	-009	NORTH AMERICA	US/CANADA	UL/CSA	10ft	9	11
	-010	SWITZERLAND	SWITZERLAND	SEV	2.5m	10	11
	-011	CONTINENTAL EUROPE	AUSTRIA FINLAND GERMANY NETHERLANDS NORWAY SWEDEN	OVE SETI VDE KEMA NEMCO SEMCO	10FT	12	15
2	-012	UK			10FT	13	15
	-013	ITALY	ITALY	IMQ	10FT	14	15
	-014	CONTINENTAL EUROPE	AUSTRIA FINLAND GERMANY NETHERLANDS NORWAY SWEDEN	OVE SETI VDE KEMA NEMCO SEMCO	10FT	12	16

1 MEDICAL/HOSPITAL GRADE - CLEAR PLUG.

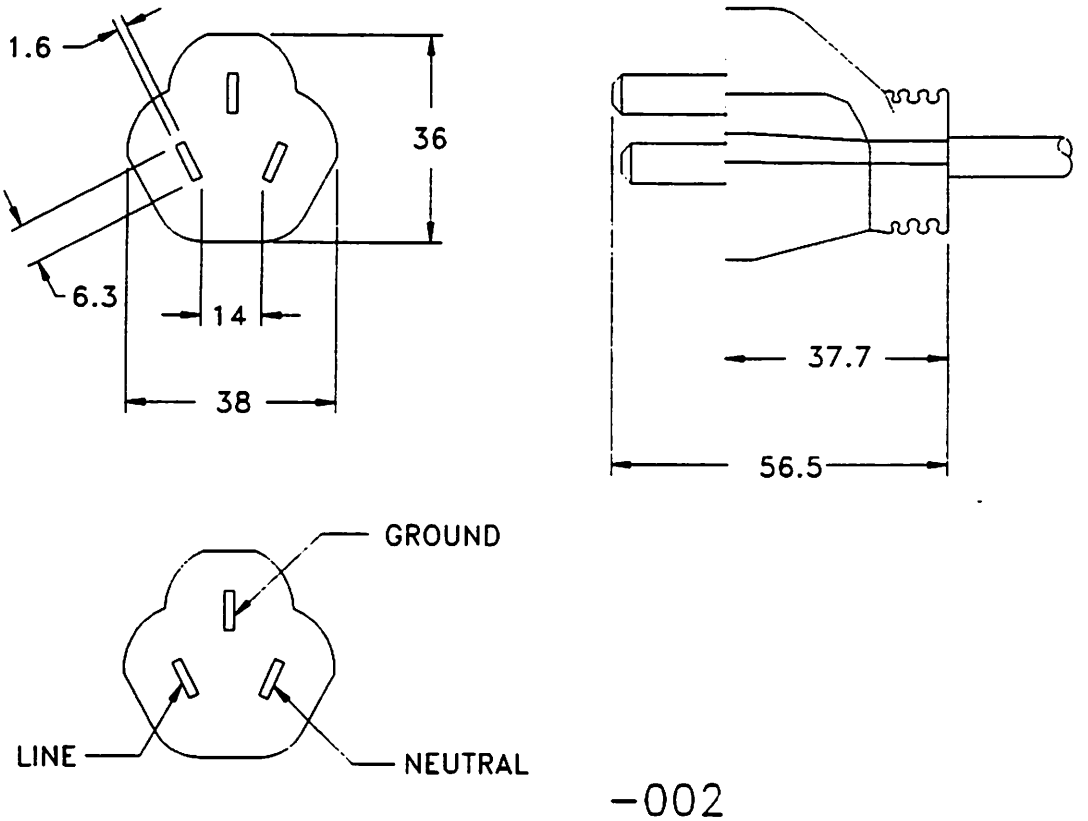
2 COMES WITH 13A FUSE.

4.0 DIMENSIONAL DATA:



-001

FIGURE 1: CONTINENTAL EUROPE

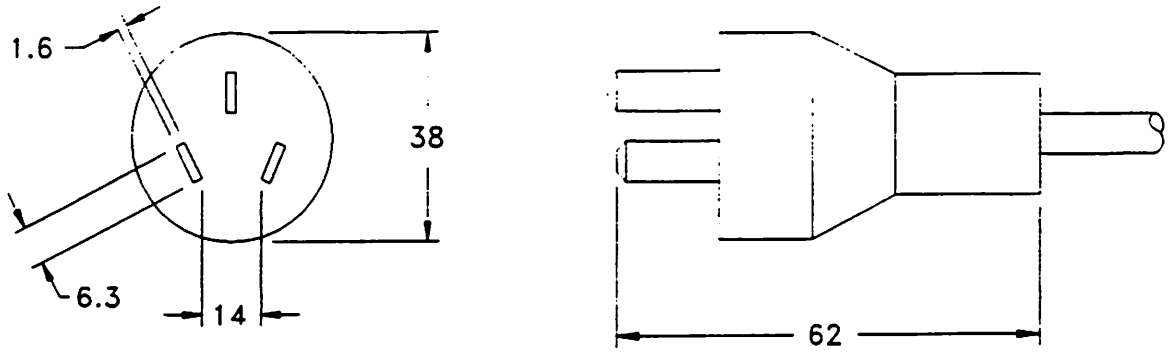


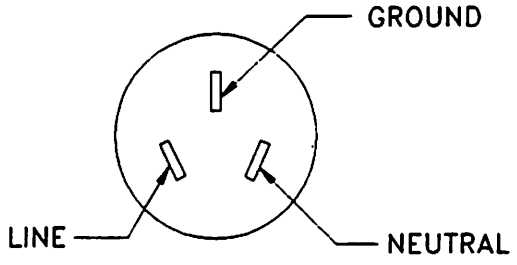
-002

POLARIZATION

FIGURE 2A: AUSTRALIA/NEW ZEALAND

SIZE		DWG. NO.	REV
A	Quinton Instrument co.	030736	E
SCALE: NONE	ACAD	SHEET 3 OF 14	



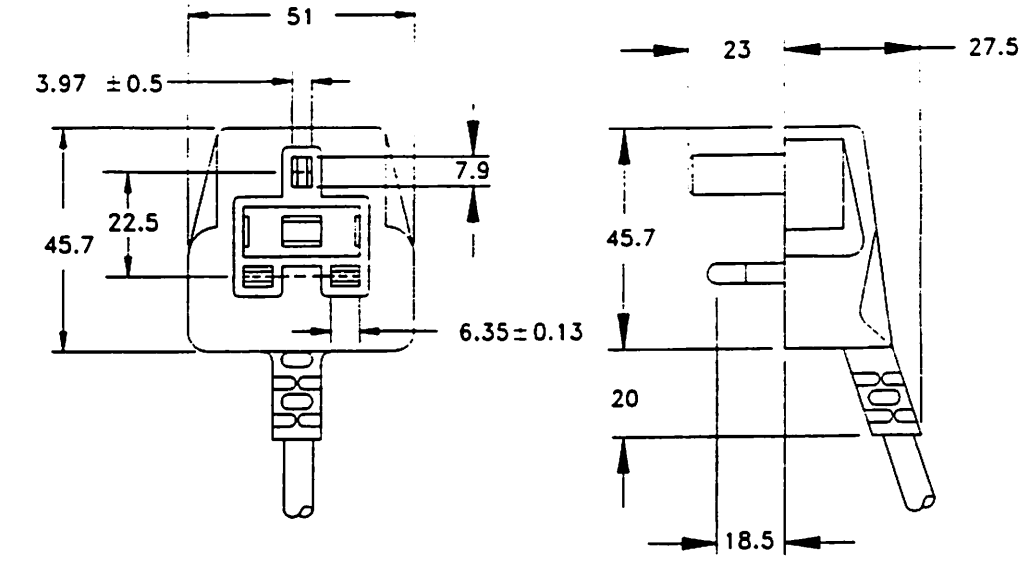


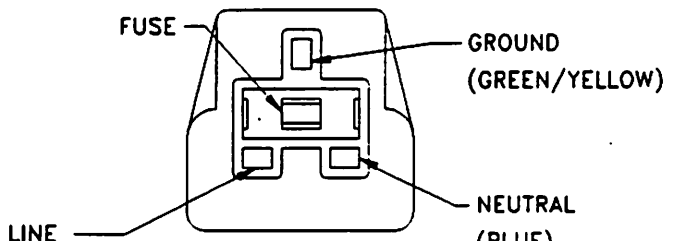
-002

POLARIZATION

FIGURE 2B: AUSTRALIA/NEW ZEALAND

SIZE		DWG. NO.	REV
A	Quinton instrument co.	030736	E
SCALE: NONE	ACAD	SHEET 6 OF 14	

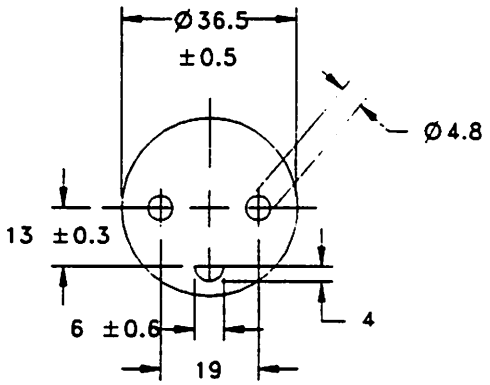


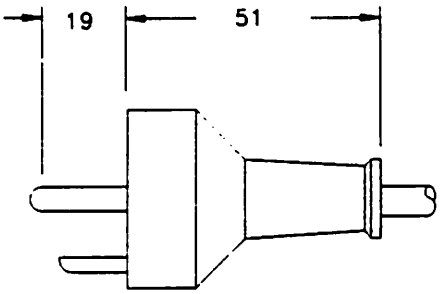


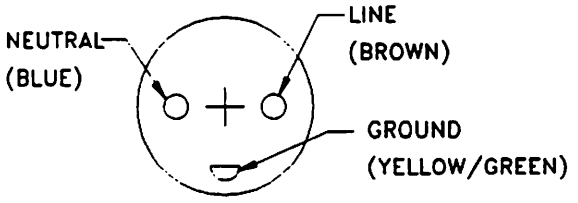
POLARIZATION

-003

FIGURE 3: UNITED KINGDOM/IRELAND





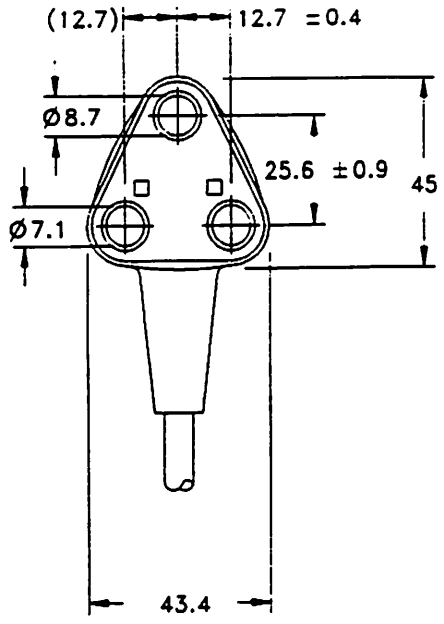


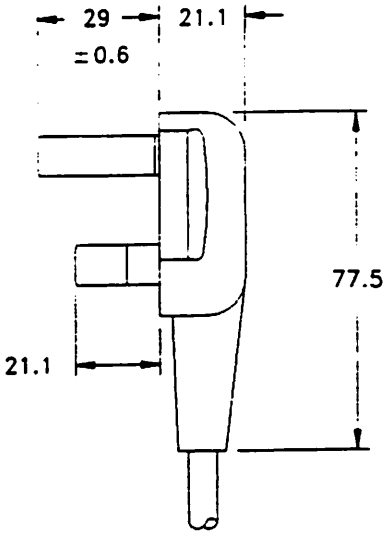
POLARIZATION

-004

FIGURE 4: DENMARK

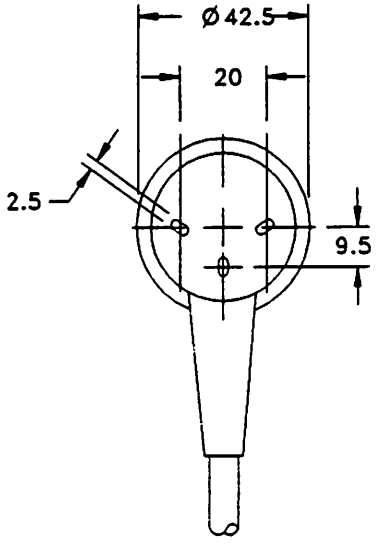
SIZE		DWG. NO.	REV
A	Quinton instrument co.	030736	E
SCALE: NONE			SHEET 7 OF 14

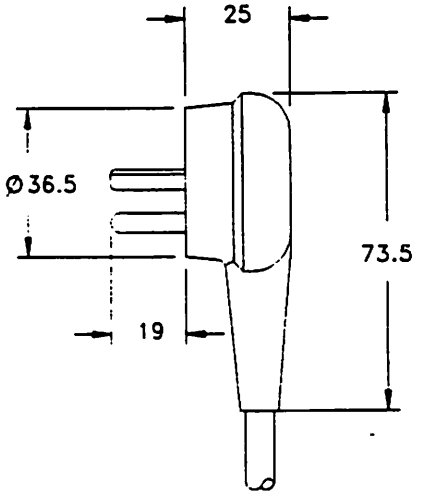


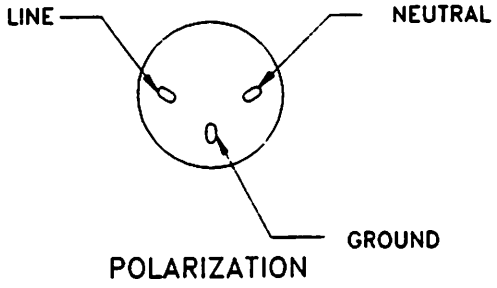


-005

FIGURE 5: INDIA



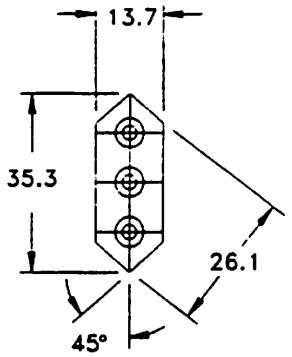


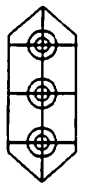


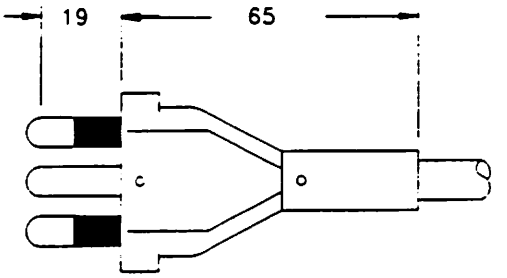
-006

FIGURE 6: ISRAEL

SIZE		DWG. NO.	REV
A	Quinton instrument co.	030736	E
SCALE: NONE			SHEET 3 OF 14



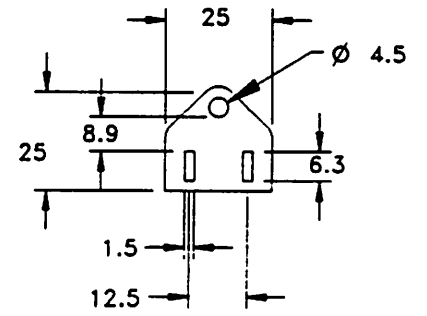


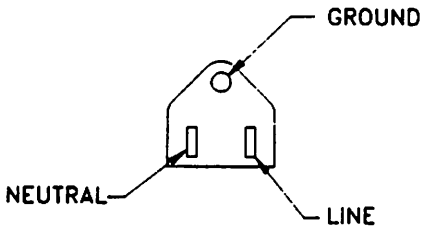


POLARIZATION
ITALIAN MAINS IS NOT POLARIZED

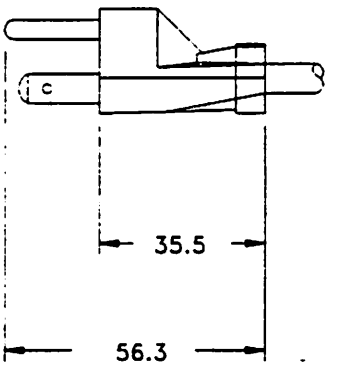
-007

FIGURE 7: ITALY





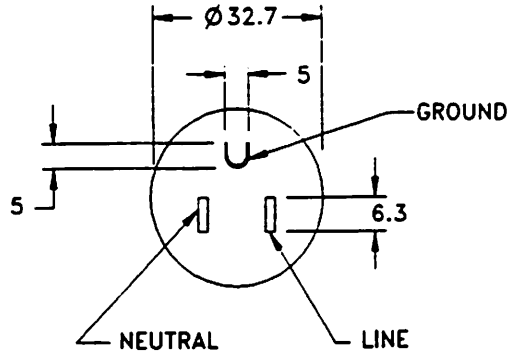
POLARIZATION

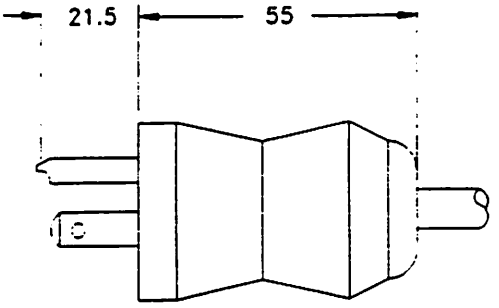


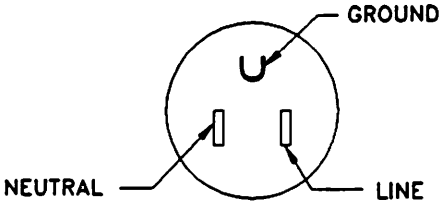
-008

FIGURE 8: JAPAN

SIZE		DWG. NO.	REV
A	Quinton instrument co.	030736	E
SCALE: NONE			SHEET 3 OF 14



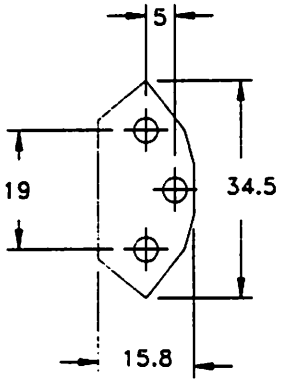


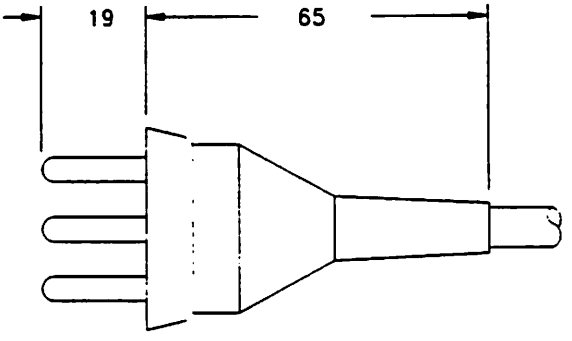


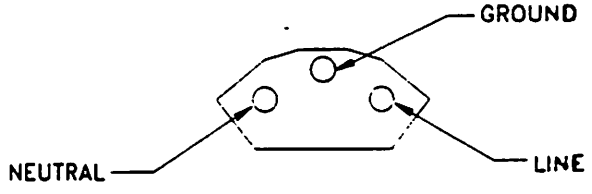
POLARIZATION

-009

FIGURE 9: NORTH AMERICA





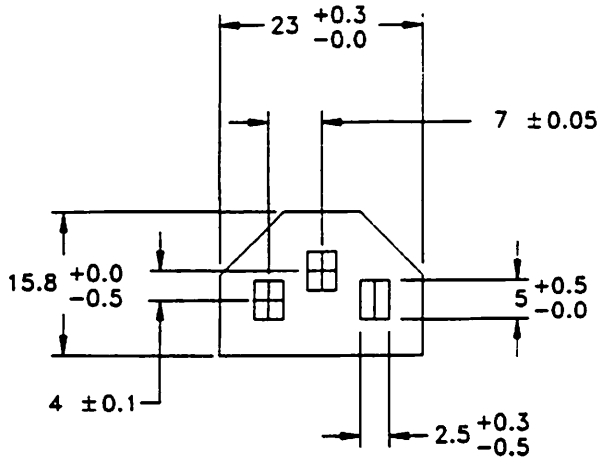


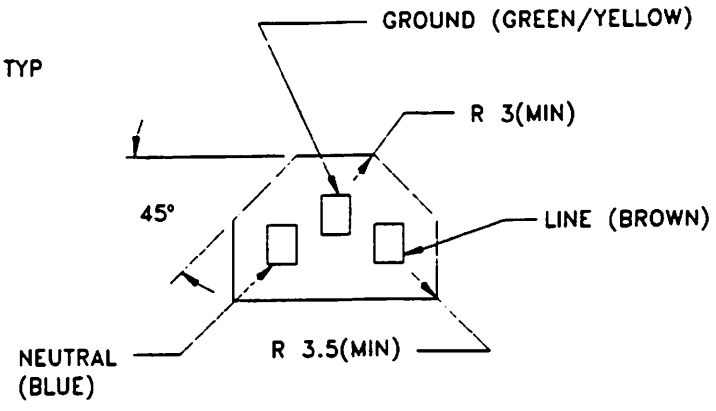
POLARIZATION

-010

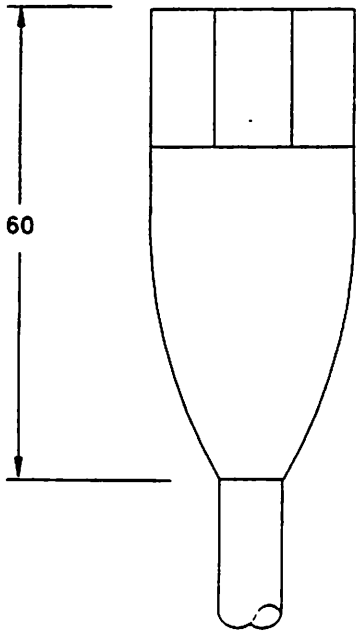
FIGURE 10: SWITZERLAND

SIZE		DWG. NO.	REV
A	Quinton instrument co.	030736	E
SCALE: NONE			SHEET 10 OF 14





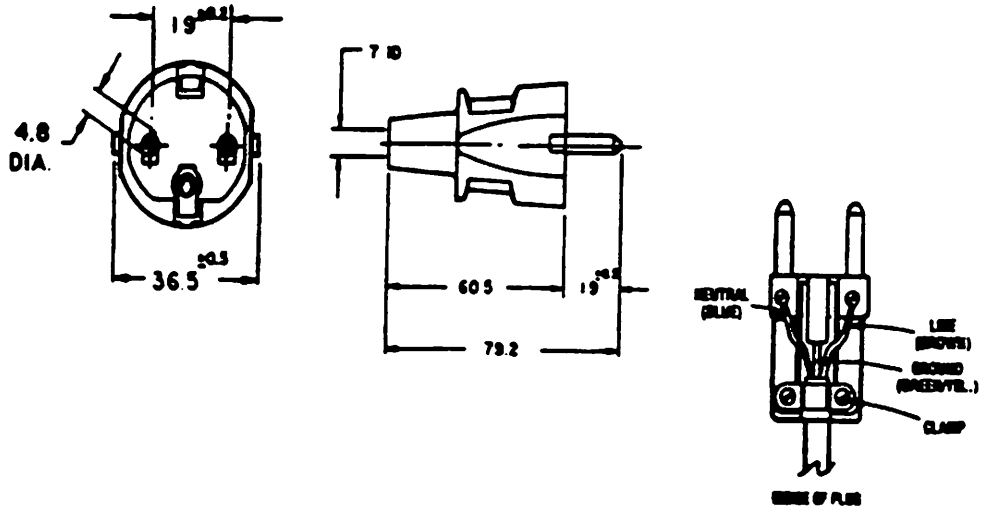
POLARIZATION



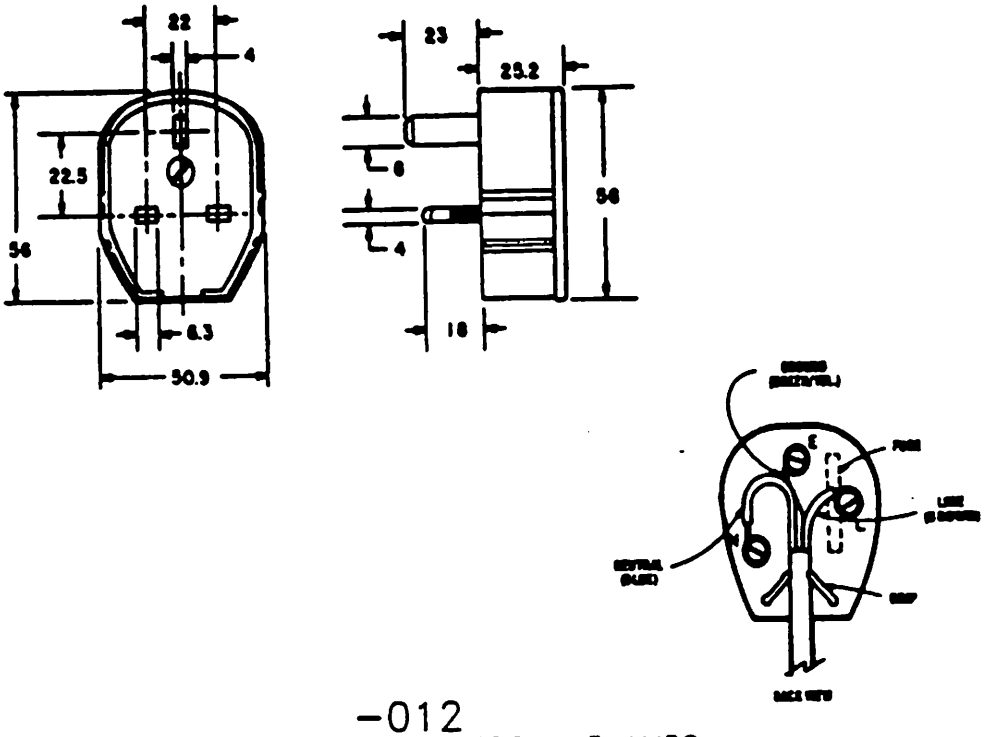
TYPICAL CONFIGURATION

FIGURE 11: END TERMINATION

SIZE		DWG. NO.	REV
A	Quinton instrument co.	030736	E
SCALE: NONE			SHEET 11 OF 14

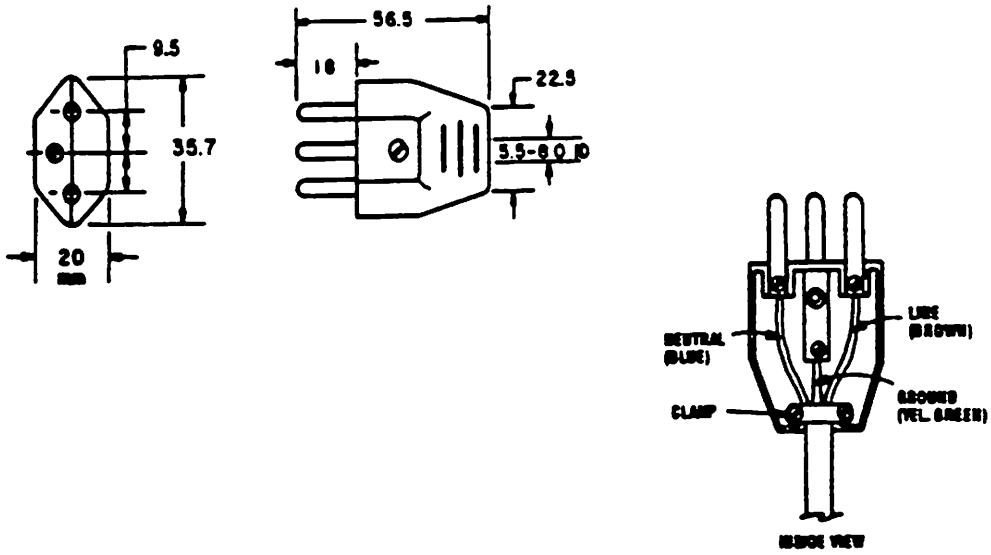


-011 & -014
FIGURE 12: CONTINENTAL EUROPE 16 AMPS



-012
FIGURE 13: UNITED KINGDOM 13 AMPS

SIZE		DWG. NO.	REV
A	Quinton instrument co	030736	E
SCALE: NONE	SOURCE: ACAD	SHEET 12 OF 14	



-013

FIGURE 14: ITALY 16 AMPS

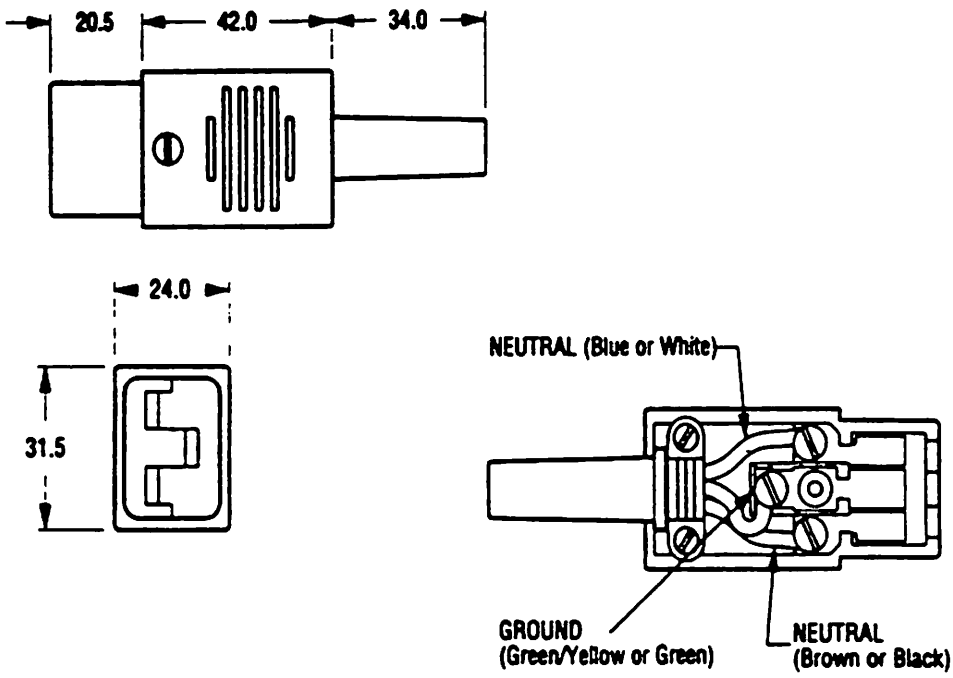
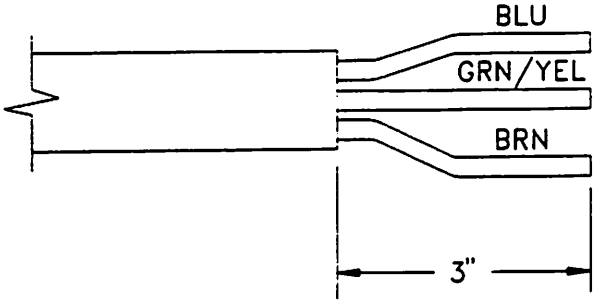


FIGURE 15: 16 AMP END TERMINATION

SIZE		DWG. NO.	REV
A	Quinton instrument co.	030736	E
SCALE: NONE	SOURCE: ACAD	SHEET 13 OF 14	

NOTE: INDIVIDUAL WIRES
NOT STRIPPED



-014

FIGURE 16: CONTINENTAL EUROPE 16 AMPS

5.0 MARKING:

PACKAGING MEDIA TO BE CLEARLY MARKED WITH MFG NAME OR SYMBOL & PART NO.

6.0 PACKAGING:

ITEMS SHALL BE SUITABLY PACKAGED FOR ACCEPTANCE BY COMMON CARRIER FOR SURFACE TRANSPORTATION, HANDLING AND STORAGE WITHOUT DETRIMENTAL EFFECTS TO THE ITEMS.

INITIAL APPLICATION			REVISIONS			
DASH NO.	NEXT ASSY.	END ITEM No.	LTR	DESCRIPTION	APPROVED	DATE
-001	STDS	STDS				

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY THE QUINTON DESIGN ENGINEERING DEPARTMENT IN THE APPLICATIONS SPECIFIED BY THIS DOCUMENT NUMBER. SUBSTITUTE ITEMS SHALL NOT BE USED.

UNIT OF MEASURE: EACH
ALL DIMENSIONS ARE IN INCHES AND NOMINAL UNLESS OTHERWISE NOTED.

1.0 DESCRIPTION: THREE POLE POWER CONTACTOR WITH 24 VDC COIL.

PRODUCTION

-001	CONTACTOR, AC POWER	1	LS4-NSW
DASH No.	DESCRIPTION	MFG CODE	MFG PART NUMBER

PARTS LIST

SOURCE CONTROL DRAWING

CLASS CODE R E L P
VALUE CODE 3 P S T / /

Quinton instrument co.
2121 TERRY AVENUE
SEATTLE, WA. 98121
206/223-7373

DRAWN	F.RAMIREZ	5/27/93
CHECKED		
ENGR.		6/22/93
MFG.		8/4/93
Q.A.		8-9-93
PURCH.		

(2)
EE CONTROLS
(1)HAWTHORNE, NY

APPROVED SOURCE(S) OF SUPPLY

TITLE
CONTACTOR, AC POWER

SIZE	DWG. NO.	REV
A	031464	-

SCALE NONE | SOURCE: ACAD | SHEET 1 OF 3

2.0 SPECIFICATIONS:

2.1 ELECTRICAL:

COIL VOLTAGE: _____ 24VDC

HORSE POWER RATING: _____ 3 HP @230 VAC

CONTACT CURRENT RATING: _____ 20A RESISTIVE

16A INDUCTIVE

2.2 MECHANICAL:

DIMENSIONAL OUTLINE: _____ PER FIGURE 1

2.3 AGENCY APPROVALS:

UL, CSA, NEMKO, SEMKO, SEV & DEMKO.

3.0 DESIGN DATA: THE FOLLOWING INFORMATION IS FOR USE BY THE DRAFTING DEPARTMENT.

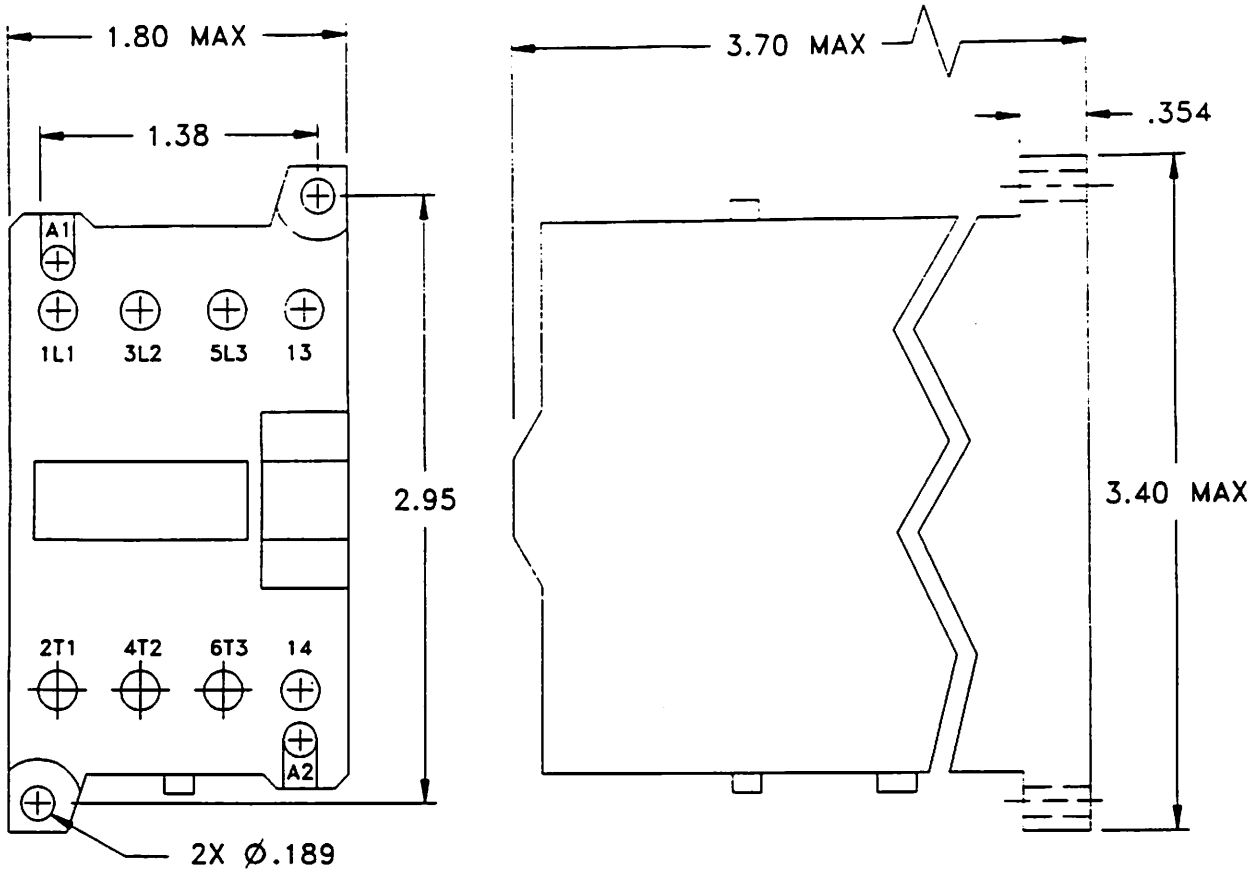
SUGGESTED MOUNTING PATTERN: _____ PER FIGURE 1

4.0 MARKING:

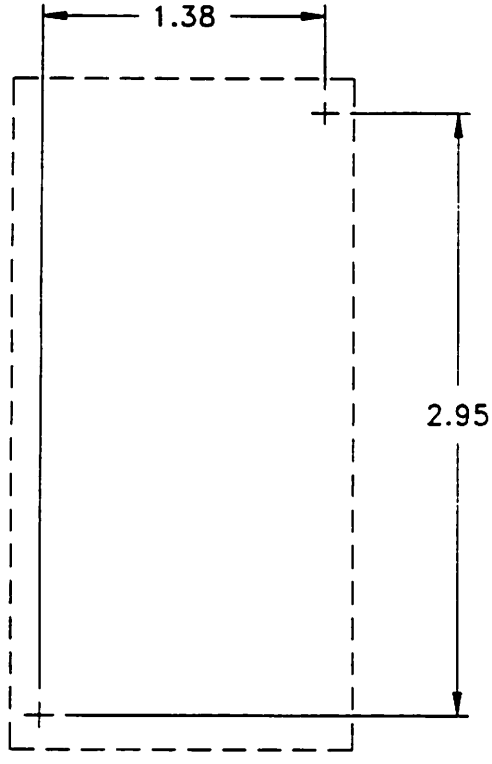
DEVICES AND/OR PACKAGING MEDIA WILL BE MARKED WITH THE MANUFACTURER'S NAME OR SYMBOL AND DEVICE TYPE.

5.0 PACKAGING:

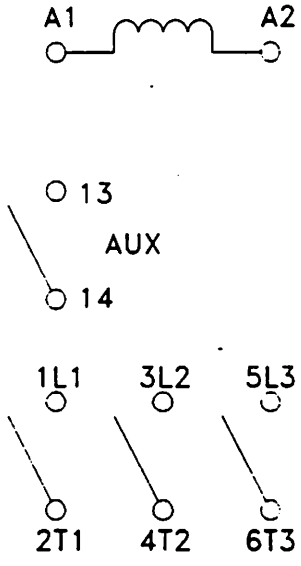
ITEMS SHALL BE SUITABLY PACKAGED FOR ACCEPTANCE BY COMMON CARRIER FOR SURFACE TRANSPORTATION, HANDLING AND STORAGE WITHOUT DETRIMENTAL EFFECTS TO THE ITEMS.



OUTLINE DIMENSIONS



SUGGESTED MOUNTING PATTERN



SCHEMATIC

FIGURE 1: PHYSICAL INFORMATION

SIZE		DWG. NO.	REV
A	Quinton instrument co.	031464	–
SCALE: NONE	SOURCE: ACAD	SHEET 3 OF 3	

INITIAL APPLICATION			REVISIONS			
DASH NO.	NEXT ASSY.	END ITEM No.	LTR	DESCRIPTION	APPROVED	DATE
ALL	VARIOUS	VARIOUS				

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON. IS APPROVED BY THE QUINTON DESIGN ENGINEERING DEPARTMENT IN THE APPLICATIONS SPECIFIED BY THIS DOCUMENT NUMBER. SUBSTITUTE ITEMS SHALL NOT BE USED.

UNIT OF MEASURE: EACH
ALL DIMENSIONS ARE IN FEET OR METERS AND NOMINAL UNLESS OTHERWISE NOTED.

1.0 DESCRIPTION: RS-232-C DATA INTERFACE CABLE ASSEMBLY.

PRODUCTION

PER TABLE 1

DASH No.	DESCRIPTION	MFG CODE	MFG PART NUMBER
PARTS LIST			

SOURCE CONTROL DRAWING

CLASS CODE C A B A
VALUE CODE 6 4 0 / / /

Quinton instrument co.
2121 TERRY AVENUE
SEATTLE, WA. 98121
206/223-7373

DRAWN	F.RAMIREZ	9/10/93
CHECKED		
ENGR.		9/21/93
MFG.		9/29/93
Q.A.	KW Bailey	10-1-93

TITLE: CABLE ASSY, INTERFACE

SIZE A | DWG. NO. 031570 | REV -

DISTRIBUTION CODE: 2 | SCALE NONE | SOURCE: ACAD | SHEET 1 OF 4

(2)
ASSMANN
(1)PHOENIX, AZ

APPROVED SOURCE(S) OF SUPPLY

031164-002A

2.0 TABLE 1: MANUFACTURER'S PART NUMBERS.

DASH NO.	MFG#1 (ASSMANN)	DESCRIPTION	
-001	A-TA1041	RS232-C CABLE, 6 FT LONG	
-002	A-TA1042	RS232-C CABLE, 10 FT LONG	

3.0 SPECIFICATIONS:

3.1 ELECTRICAL:

CABLE:

VOLTAGE RATING: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 300V
CAPACITANCE: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 35 pF/FT NOM
IMPEDANCE: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 50 OHMS NOM

CONNECTORS:

CONTACT CURRENT RATING: _ _ _ _ _ _ _ _ _ _ _ 2 AMPS MIN
DIELECTRIC WITHSTANDING VOLTAGE: _ _ _ _ _ _ _ _ 1KV MIN
INSULATION RESISTANCE: _ _ _ _ _ _ _ _ _ _ _ 5 KMEG OHMS
INITIAL CONTACT RESISTANCE: _ _ _ _ _ _ _ 10m OHMS MAX
(@ 10mV & 10mA)

3.2 MECHANICAL:

OUTLINE DIMENSIONS: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ PER FIGURE 1

CONFIGURATION:

A SHIELDED 25 CONDUCTOR CABLE TERMINATED PIN 1 TO PIN 1, 2 TO 2 ETC, TO A 25 POSN D-SUB SOCKET CONNECTOR ON ONE END AND A 25 POSN D-SUB PIN CONNECTOR ON THE OTHER WITH THE SHIELD TERMINATED SHELL TO SHELL.

A PLASTIC SHROUD WITH SELF CONTAINED JACK SCREWS AND A CABLE STRAIN RELIEF FEATURE IS TO BE MOLDED ON TO EACH END OF THE CABLE.

3.3 MATERIALS:

CABLE:

CONDUCTORS: _____ #26 AWG (7/34) TINNED COPPER WITH PVC INSULATION

SHIELD: _____ AL/POLYESTER FOIL WITH STRANDED TINNED COPPER DRAIN WIRE

OUTER JACKET: _____ BEIGE PVC, .032 THICK

STRAIN RELIEF: _____ BEIGE UL 94 V0 THERMOPLASTIC

CONNECTORS:

INSULATOR: _____ UL 94 V0 THERMOPLASTIC

CONTACTS: PINS: _____ COPPER ALLOY
SOCKETS: _____ PHOSPHOR BRONZE OR BERYLLIUM COPPER

CONTACT PLATING: _____ 15u INCH MIN GOLD OVER 50u INCH MIN NICKEL

SHELL: _____ TIN PLATED STEEL

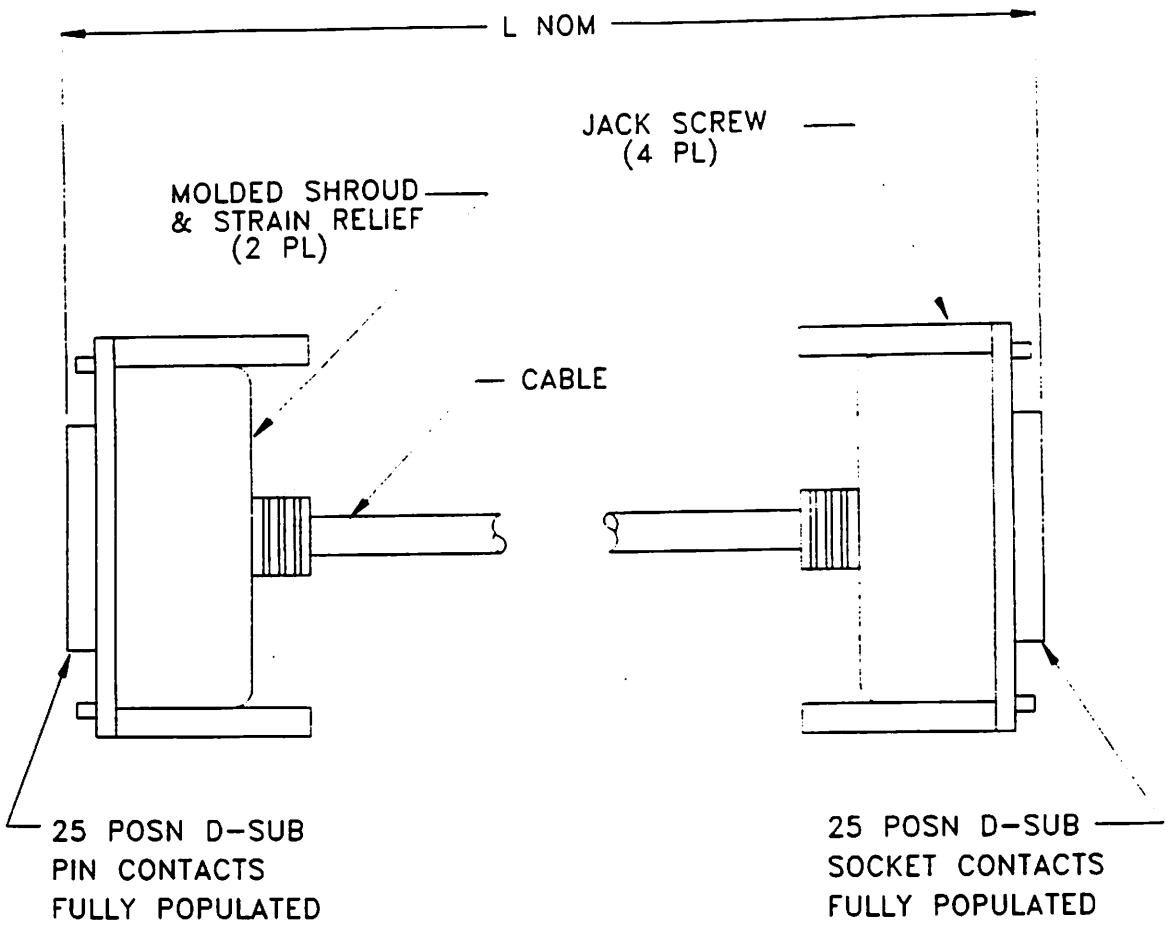
4.0 MARKING:

COMPLETED CABLES ARE TO BE COILED AND TAGGED WITH THE QUINTON INSTRUMENTS PART NUMBER.

PACKAGING MEDIA WILL BE MARKED WITH THE MANUFACTURER'S NAME OR SYMBOL AND PART NUMBER.

5.0 PACKAGING:

ITEMS SHALL BE SUITABLY PACKAGED FOR ACCEPTANCE BY COMMON CARRIER FOR SURFACE TRANSPORTATION, HANDLING AND STORAGE WITHOUT DETRIMENTAL EFFECTS TO THE ITEMS.



DASH NO.	LENGTH (L)	
	FEET	METERS
-001	6	2
-002	10	3

SIZE		DWG. NO.	REV
A	Quinton instrument co.	031570	-
SCALE: NONE	SOURCE: ACAD	SHEET 4 OF 4	

031164-004A

INITIAL APPLICATION			REVISIONS			
DASH NO.	NEXT ASSY.	END ITEM No.	LTR	DESCRIPTION	APPROVED	DATE
-001	STDS	STDS				

ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDOR(S) LISTED HEREON IS APPROVED BY THE QUINTON DESIGN ENGINEERING DEPARTMENT IN THE APPLICATIONS SPECIFIED BY THIS DOCUMENT NUMBER. SUBSTITUTE ITEMS SHALL NOT BE USED.

UNIT OF MEASURE: EACH
ALL DIMENSIONS ARE IN INCHES AND NOMINAL UNLESS OTHERWISE NOTED.

1.0 DESCRIPTION: POWER CORD WITH QUICK DISCONNECT TERMINALS.

PRODUCTION

PER TABLE 1

DASH No.	DESCRIPTION	MFG CODE	MFG PART NUMBER

PARTS LIST

SOURCE CONTROL DRAWING

CLASS CODE	C O R D	Quinton instrument co.	2121 TERRY AVENUE SEATTLE, WA. 98121 206/223-7373
VALUE CODE	/ / / / / /		

DRAWN	F.RAMIREZ	7/29/93	TITLE	CORD, POWER	
CHECKED					
ENGR.		8/5/93			
MFG.		8/6/93	SIZE A	DWG. NO. 031602	REV -
Q.A.		8/9/93			
DISTRIBUTION CODE: 2			SCALE NONE	SOURCE: ACAD	SHEET 1 OF 6

(2)

ASSMANN

(1)TEMPLE, AZ

APPROVED SOURCE(S) OF SUPPLY

031164-002A

2.0 TABLE 2: MANUFACTURER'S PART NUMBERS.

DASH NO.	MFG #1 (ASSMANN)	MFG #2	MFG #3
-001	A-CA2338		
-002	A-CA2339		
-003	A-CA2340		
-004	A-CA2346		

3.0 SPECIFICATIONS:

3.1 ELECTRICAL:

VOLTAGE RATING: -001 ..... 125V
-002 ..... 125V
-003 ..... 250V
-004 ..... 250V

CURRENT RATING: -001 ..... 15A
-002 ..... 30A
-003 ..... 15A
-004 ..... 20A

3.2 MECHANICAL:

CABLE CONFIGURATION: -001 ..... PER FIGURE 1
-002 ..... PER FIGURE 2
-003 ..... PER FIGURE 3
-004 ..... PER FIGURE 4

3.3 APPROVALS:

ALL MATERIALS TO COMPLY WITH APPROPRIATE UL & CSA REQUIREMENTS FOR MEDICAL APPLICATIONS.

4.0 MARKING:

PACKAGING MEDIA WILL BE MARKED WITH THE MANUFACTURER'S NAME OR SYMBOL AND THE QUINTON INSTRUMENTS PART NUMBER.

5.0 PACKAGING:

CORDS WILL BE PACKAGED INDIVIDUALLY (COILED AND TIED PREFERRED) AND TAGGED WITH THE QUINTON PART NUMBER.

INDIVIDUALLY PACKAGED CORDS SHALL BE SUITABLY PACKAGED FOR ACCEPTANCE BY COMMON CARRIER FOR SURFACE TRANSPORTATION, HANDLING AND STORAGE WITHOUT DETRIMENTAL EFFECTS TO THE CORDS.

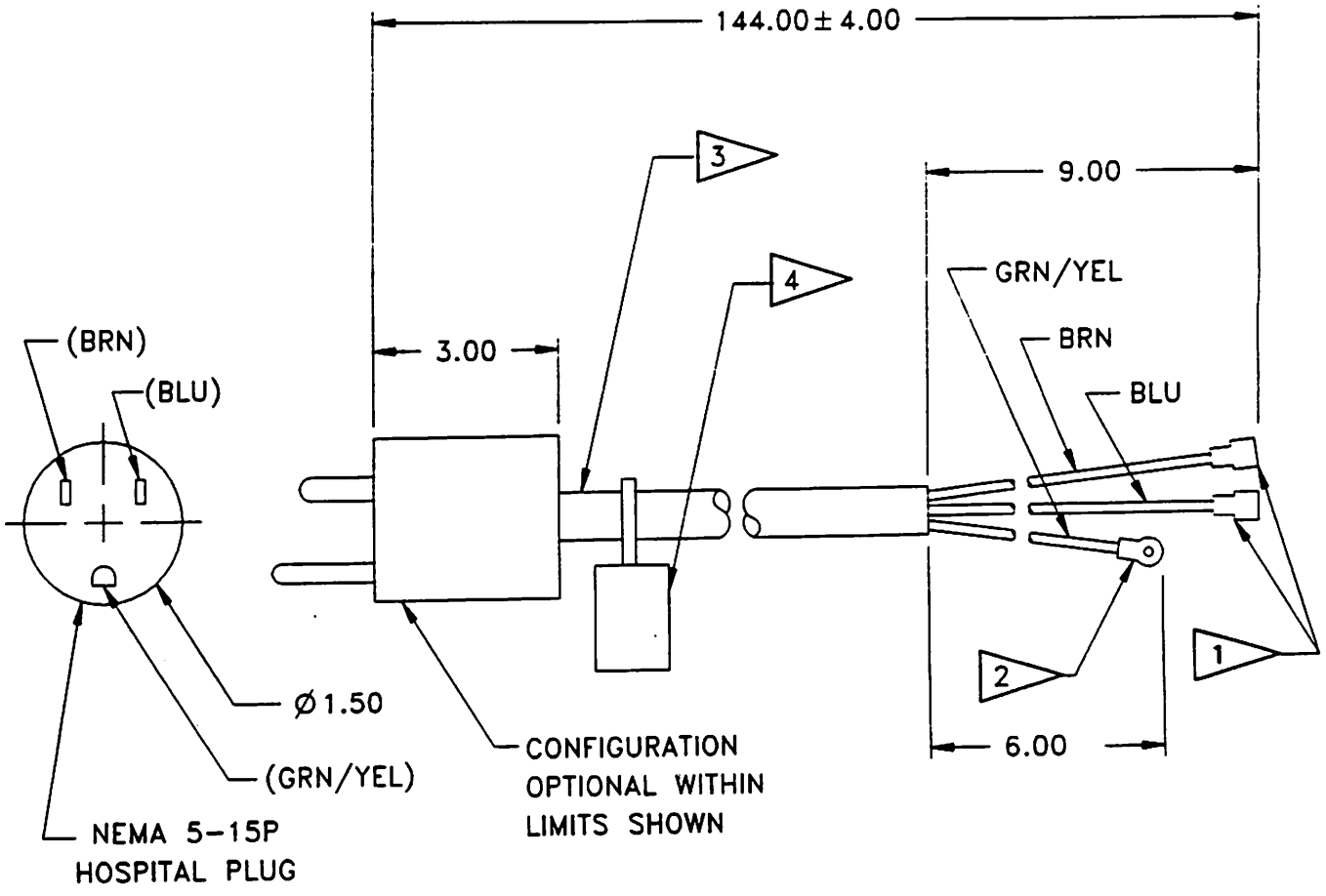


FIGURE 1: (-001) 15 AMP, 125 VOLT POWER CORD

1. DOUBLE CRIMP QUICK DISCONNECTS FOR NEMA .032 x .250 TAB (2 PLACES). (HOLLINGSWORTH XS09787 OR EQUIV.)
2. DOUBLE CRIMP RING TERMINAL FOR #10 SCREW. (HOLLINGSWORTH XR1903SN OR EQUIV.)
3. 3 X 14 AWG SJT CORDAGE.
4. GROUNDING LABEL (Q.I. PART NUMBER 016256-001 OR EQUIV.)

SIZE		DWG. NO.	REV
A	Quinton instrument co.	031602	-
SCALE: NONE	SOURCE: ACAD	SHEET 3 OF 6	

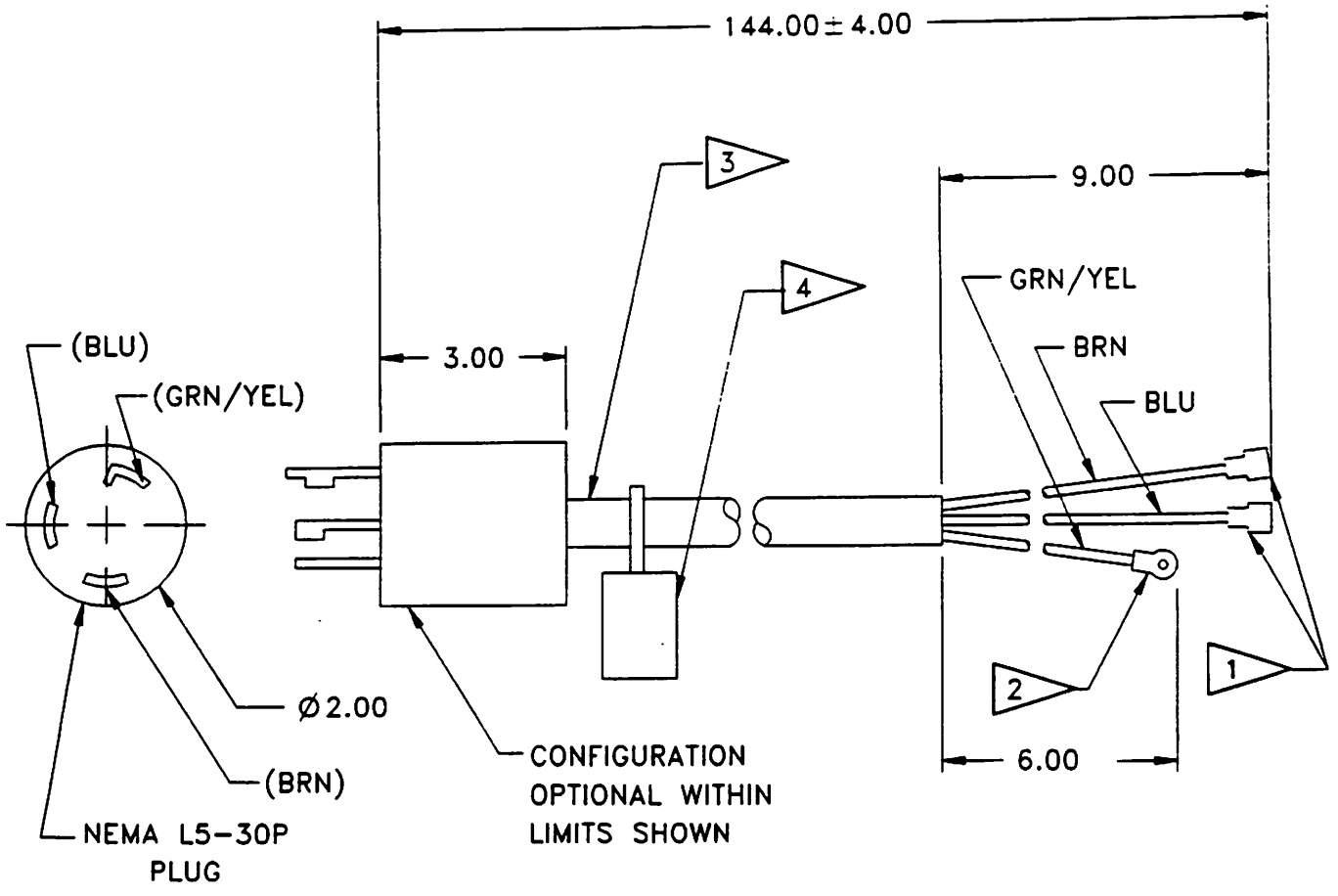


FIGURE 2: (-002) 30 AMP, 125 VOLT POWER CORD

1. DOUBLE CRIMP QUICK DISCONNECTS FOR NEMA .032 x .250 TAB (2 PLACES). (HOLLINGSWORTH XS09788 OR EQUIV.)
2. DOUBLE CRIMP RING TERMINAL FOR #10 SCREW. (HOLLINGSWORTH XR5109N OR EQUIV.)
3. 3 X 10 AWG SJT CORDAGE.
4. GROUNDING LABEL (Q.I. PART NUMBER 016256-001 OR EQUIV.)

SIZE		DWG. NO.	REV
A	Quinton instrument co.	031602	-
SCALE: NONE	SOURCE: ACAD	SHEET 4 OF 6	

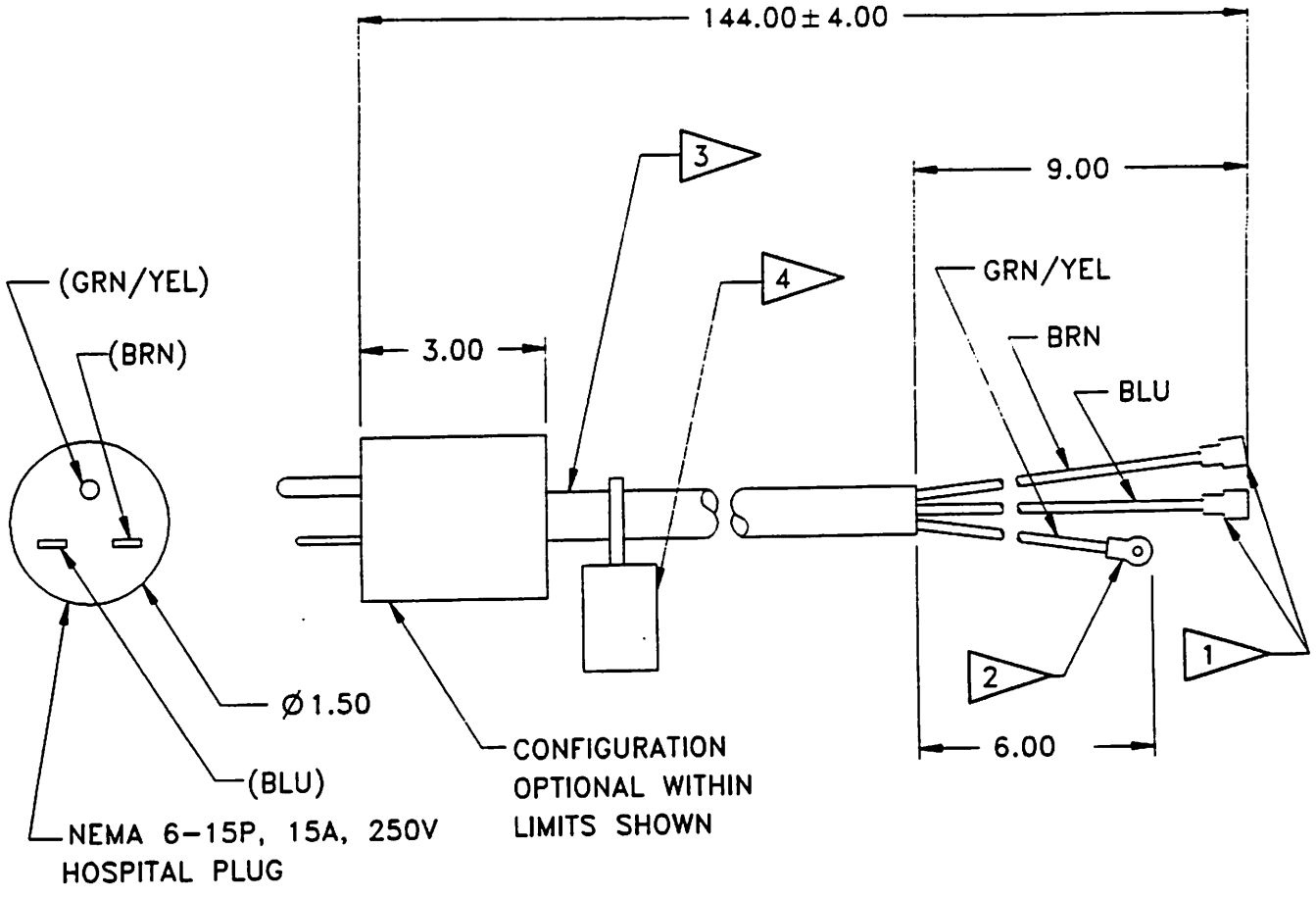


FIGURE 3: (-003) 15 AMP, 250 VOLT POWER CORD

1. DOUBLE CRIMP QUICK DISCONNECTS FOR NEMA .032 x .250 TAB (2 PLACES). (HOLLINGSWORTH XS09787 OR EQUIV.)
2. DOUBLE CRIMP RING TERMINAL FOR #10 SCREW. (HOLLINGSWORTH XR1903SN OR EQUIV.)
3. 3 X 4 AWG, 60°C, 300V, SJT CORDAGE.
4. GROUNDING LABEL (Q.I. PART NUMBER 016256-001 OR EQUIV.)

SIZE		DWG. NO.	REV
A	Quinton instrument co.	031602	-
SCALE: NONE	SOURCE: ACAD	SHEET 5 OF 6	

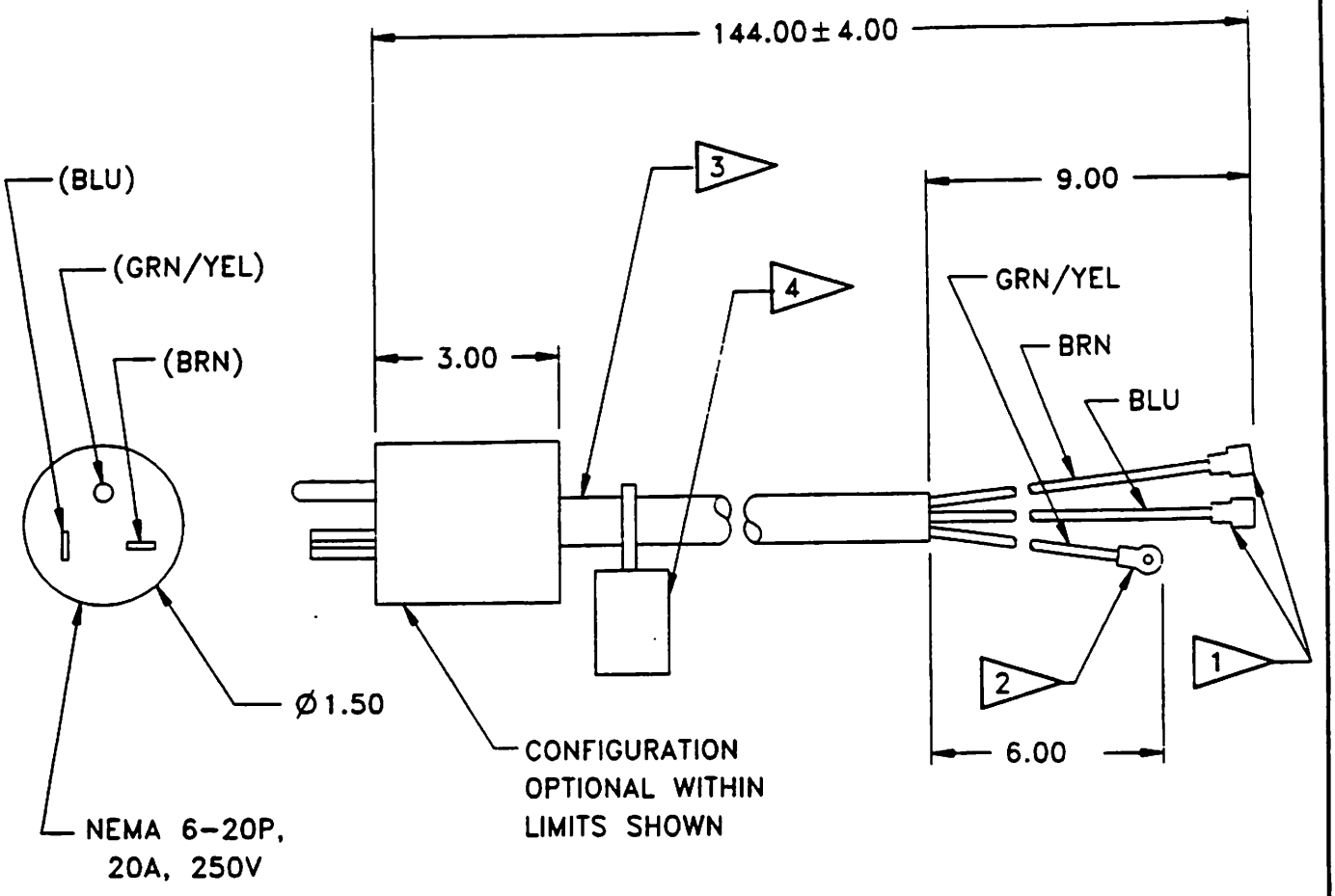


FIGURE 4: (-004) 20 AMP, 250 VOLT POWER CORD

1. DOUBLE CRIMP QUICK DISCONNECTS FOR NEMA .032 x .250 TAB (2 PLACES). (HOLLINGSWORTH XS09787 OR EQUIV.)
2. DOUBLE CRIMP RING TERMINAL FOR #10 SCREW. (HOLLINGSWORTH XR1903SN OR EQUIV.)
3. 3 X 14 AWG, 60°C, 300V, SJT CORDAGE.
4. GROUNDING LABEL (Q.I. PART NUMBER 016256-001 OR EQUIV.)

SIZE		DWG. NO.	REV
A	Quinton instrument co.	031602	-
SCALE: NONE	SOURCE: ACAD	SHEET 6 OF 6	

031164-004A