BIODEX RTM 400
REHABILITATION TREADMILL

INSTALLATION/ OPERATION MANUAL

950-275
950-276

BIODEX
Biodex Medical Systems, Inc.
20 Ramsay Road, Shirley, New York, 11967-4704, Tel: 800-224-6339 (*In NY and Int'l, call 631-924-9000),* Fax: 631-924-9338, Email: sales@biodex.com, www.biodex.com

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RTM 400 REHABILITATION TREADMILL

This manual contains installation and operation procedures for the following:

950-275 RTM 400 Treadmill (115V)
950-276 RTM 400 Treadmill (230V)

NOTE: The following symbol on your Biodex RTM Treadmill corresponds to the RTM Operation Manual:

Symbol Signification: Attention, se référer à la notice

Symbol Meaning: Attention, consult accompanying documents

CAUTION: Federal law restricts this device to sale by or on the order of a medical practitioner. When prescribed for therapeutic purpose, a physician should clearly define the parameters of use (i.e., total work, maximum heart rate, etc.) to reduce the risk of patient injury.

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1. INTRODUCTION

Designed specifically for rehabilitation purposes, the Biodex RTM 400 Rehabilitation Treadmill provides unparalleled speed control and durability, incline and decline in both forward and reverse directions, digital feedback, a neat, trim, low profile, a choice of handrail configurations. An easy-to use numeric display allows the user to get the patient up and moving in a matter of seconds.

The RTM 400 allows patients to walk, jog and run as they exercise every muscle targeted in their personalized rehabilitation program. Optional handrail configurations allow clinicians to tailor the treadmill for various applications including physical therapy/sports medicine, cardiac/pulmonary rehabilitation, geriatric and pediatric conditioning, and use with neurological patients.

Additionally, 4Q Pulse Width Modulation motor control, the same motor control that helped make the Biodex Dynamometer the worldwide choice for extremity testing and rehabilitation, provides more consistent speed control than either AC or DC treadmill models can ever hope to attain. With track speeds of 0-10 mph (16.9 Km/h) in forward and 0-3 mph (4.8 Km/h) in reverse, a zero starting speed, the ability to change speeds in .1-mph (.2-Km/h) increments, easy to read displays and touch-key operation, PWM motor control and a choice of handrail configurations, the RTM 400 is among the safest and most versatile treadmills available today.

2. ⚠ CLINICAL CONSIDERATIONS

1. All patients should consult a physician before beginning any rehabilitation program.

   Tous les patients doivent voir leur médecin responsable avant d'entreprendre la séance de rééducation.

2. Instruct patient on proper use and all treadmill safety features before beginning exercise.

   Expliquer au patient la bonne utilisation des systémes de sécurité du tapis avant de démarrer la séance.

3. ⚠ *Always attach the Safety Lanyard to the patient's clothing before allowing treadmill exercise to begin.*

   ⚠ *Connector toujours la sangle de sécurité aux vêtements du patient avant que le patient ne commence à travailler.*

4. Ensure patient has stretched and warmed up prior to starting treadmill exercise.

   Vérifier que la patient s'est échauffé et a fait des étirements avant de commencer l'entraînement sur le tapis.

5. Do not allow any patient to exercise unattended on the treadmill. Never leave the treadmill running while unattended.

   Ne pas laisser le patient seul sur le tapis pendant la séance. Ne jamais laisser le tapis tourner sans patient et sans surveillance.

6. Periodically monitor the heart rate of any patient that is exercising on the treadmill.

   Surveiller de temps à autre la fréquence cardiaque du patient pendant la séance.

7. Begin all treadmill exercise at slow pace, increasing speed gradually to patient tolerance or exercise goal. Always inform the patient immediately prior to increasing or decreasing treadmill speed or elevation.

   Démarrer les protocloes à une vitesse lente et augmenter progressivement la vitesse en fonction de la tolérance du patient et des objectifs de la séance. Signaler avant de l'appliquer tonte augmentation ou diminution de vitesse ou d'inclinaison.

8. If reversing treadmill direction, bring the treadmill to a complete stop and inform patient that the treadmill will begin moving in the opposite direction.

   Avant de changer la direction de déplacement du tapis, arrêter le tapis complétement et expliquer au patient que le tapis va démarrer dans le sens opposé.

9. Immediately discontinue exercise if patient feels faint, dizzy or short of breath.

   Arrêter la séance immédiatement en cas de dyspnée, d'étourdissements ou d'autres signes de malaise

10. Never allow anyone to step onto the treadmill while the treadbelt is in motion. Always stop the treadmill prior to allowing the patient to step up onto the treadbelt.

    Ne jamais faire monter personne sur le tapis pendant que le tapis est en marche. Arrêter to jours le tapis avant que le patient ne s'y positionne.

11. Instruct patients to use the handrails when first learning to walk on the treadmill.

    Donner la consigne au patient d'utiliser les barres horizontales lors de sa premiére séance sur le tapis.

3. THE NUMERIC DISPLAY/CONTROL PANEL

The Biodex RTM 400 with Numeric Display provides a simple-to-use, easy-to-read, no-nonsense approach to treadmill exercise. Real time readings are displayed for Time, Distance, Calories and MET values. At the touch of a key, users can select speed, elevation and belt direction, or set an end time for exercise duration.

POWER-UP
To provide power to the treadmill, ensure the power plug is connected to an appropriate socket. Press the ON/OFF switch, located on the base of the treadmill in the left corner at the front end, to the "l" (ON) position. All display windows should illuminate to indicate that power to the treadmill is ON and the display is active.

RTM 400 NUMERIC DISPLAY PANEL CONTROL KEYS AND FUNCTIONS *(See Figure 1.)*
<Start>: Pressing the <Start> key with the treadmill ON activates the treadbelt and clock, and commands the system to begin gathering data with commencement of the exercise session. Initial starting speed for treadbelt movement in either forward or reverse direction is 0 mph. Speed can be increased or decreased in .1 mph increments.

<Stop>: Press <Stop> at any time to ramp the treadmill to a complete stop. All data on the screen will be retained. At this point, you can press <Clear Display> to end the session and immediately clear all data, or press <Stop> to end the session but retain all data for 90 seconds before it is cleared.

<Speed>: Use the <Speed> <+> and <-> control keys on the left side of the display to adjust the speed to the desired level. The speed will immediately respond to your input so be sure to inform the patient that the treadbelt will begin to accelerate or decelerate. Gathering of data begins immediately at the point from which the treadmill begins to move in either forward or reverse direction.

<Elevation>: If incline or decline is desired, use the <Elevation> <+> and <-> control keys in the middle of the display panel to set the appropriate grade. Incline and decline can range from 0 to 15% grade. Note that there is a slight delay between movement of the Elevation display bar and the actual movement of the treadmill.

<Belt Direction>: Treadmill belt direction is selected via the <Forward> or <Reverse> keys. Belt direction can be changed only when speed is set to 0 speed. If you try to change direction while the treadbelt is moving, the system will automatically ramp down to 0 speed and wait for further input. For reverse direction, a minus (-) sign precedes the speed value. An orange LED denotes the selected belt direction.

<Select Display>: The <Select Display> key, located at the center of the control panel's top section, is used to determine which parameter will be displayed as data is acquired. All parameters are listed to the left of the <Select Display> key. An LED denotes the currently active parameter. Once you press the <Start> key, the display will scroll through the parameters, showing each for a 15-second interval before moving onto the next. An LED, to the left of the currently displayed parameter, denotes the active selection. To constantly display a single parameter, use the <Select Display> to rotate through the parameter list and make your selection *after* the treadbelt has begun to move.

For all parameters, immediate biofeedback is provided in numeric format for the selected parameter, as described below:

- Time: Cumulative time in minutes/seconds from the point at which the treadbelt begins to move in either direction.

- Distance (Miles/Kilometers): The distance covered in miles or kilometers from the beginning to the end of the current exercise session.

- Calories: Total calories burned by the user during the current exercise session. This value is cumulative.

- METs: The METs value reflects the resting rate of Oxygen consumption with one MET equal to the Oxygen consumption of a seated individual at rest. Thus, a seated individual in a resting state is consuming 1 MET. A seated individual exercising at a rate of 2 METs is consuming twice the Oxygen of a seated, resting individual. A person exercising at 10 METs is consuming ten times the Oxygen of a seated, resting individual. To compute the METs of a person actively exercising on the RTM 400 Treadmill, the system uses standard calculations based on American College of Sports Medicine Guidelines for Testing and Exercise. On the RTM 400 Treadmill, the MET's value is always displayed in real-time for current speed.

<*Clear Display*>: Pressing this key immediately clears the system of all acquired data and resets all display parameters to their default settings.

<*Set Weight*>: Press the <Set Weight> key to display the default weight setting of 150 pounds. To alter the default setting, use the <+> or <-> keys on the right side of the display. The set weight parameter is used to calculate Calories.

<*Set Time*>: Press the <Set Time> key to display the default time setting of 15:00. To alter the default setting, use the <+> or <-> keys on the right side of the display. Use the Set Time function to provide an end time for exercise duration. Once a time has been entered, the clock will begin counting down from the point the treadbelt begins to move.

Safety Lanyard and Safety Stop: Disconnecting the Safety Lanyard (to the left side of Display/Control Panel) or pressing the red Safety Stop (to the right side of Display/Control Panel on the upper frame) at any time will cause the treadbelt to immediately ramp down to a full stop and reset to 0.0 mph. The Display will read <Safe> and the treadbelt will not restart until the lanyard is once again in position or <Start> is pressed following use of the Safety Stop. Display data is not lost in either case. Data accumulation will resume once the lanyard is reconnected or <Start> has been pressed. To fully abort an exercise session after pressing the Safety Stop, press <Clear Display>.

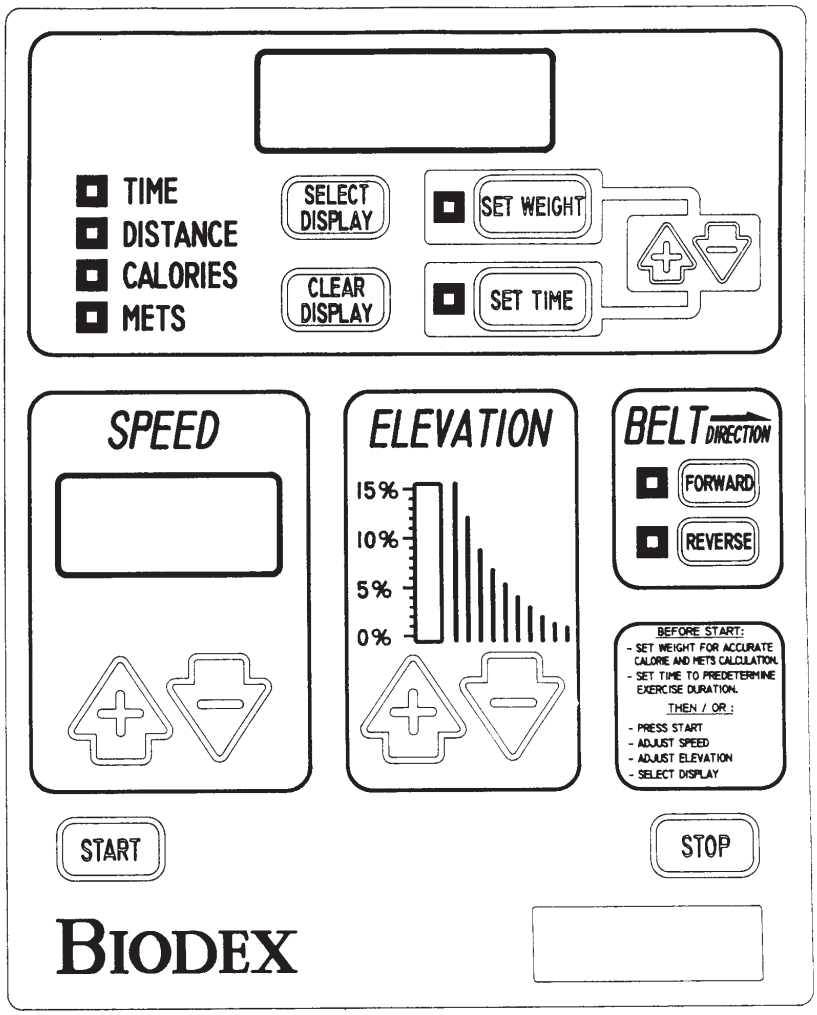


Figure 1. The RTM 400 Numeric Display/Control Panel.

4. BASIC OPERATION OF THE RTM 400

At this point, the RTM 400 should be ready for operation. To get the treadmill up and running simply follow the procedure below.

1. Ensure that the <ON/OFF< switch, located on the left side of the front base, is set to the "l" (ON) position. The Numeric Display should be illuminated, indicating that power to the treadmill is ON.

2. If desired, use the <Set Weight> keys to enter a weight to be used for calorie calculation. Default value is 150 pounds (68 kg).

3. If desired, use the <Set Time> keys to predetermine exercise duration.

4. Position the patient on the treadmill and explain the exercise routine.

5. Tilt the display panel for patient viewing comfort.

6. Attach the Safety Lanyard at the left corner of the top cross bar which supports the Display panel. The round end of the lanyard attaches to the unit via a Velcro® brand hook and loop fastener. The clip end of the lanyard should be attached to the patient's clothing in a way that does not interfere with the patient's exercise.

⚠ ***NOTA:*** *La déconnexion de la sangle de sécurité (côté gauche du panneau d'affichage et de contrôle) ou l'actionnement du bouton rouge d'arrêt d'urgence (côté droit du panneau d'affichage et de contrôle) entraîneront à tout. moment l'arrêt progressif du tapis et le réglage de la vitesse à 0.0 kn/heure. L'afficage indiquera qu'il y a eu un probléme de sécurité et le tapis ne redémarrera pas tant que la sangle ne sera pas bien positionnée. De la même façon, aprés l'arrêt par le bouton d'urgence, le tapis ne démanera pas tant que le bouton de démarrage ne sera pas actionné. Les données affichées ne seront perdues ni dans l'un ni dans l'autre cas. L'enregistrement des données reprendra une fois la sangle sera reconnectée et que le bouton de démarrage aura été actionné. Pour arrêter complétement une séance aprés un arrêt de sécurité, appuyer sur la touche commande d'effaçage.*

⚠ ***NOTE:*** *Disconnecting the Safety Lanyard (to the left side of Display/Control Panel) or pressing the red safety Stop (to the right side of Display/Control Panel on the upper frame) at any time will cause the treadbelt to immediately ramp down to a full stop and reset to 0.0 mph. The Display will read <Safe> and the treadbelt will not restart until the lanyard is once again in position or <Start> is pressed following use of the Safety Stop. Display data is not lost in either case. Data accumulation will resume once the lanyard is reconnected or <Start> has been pressed. To fully abort an exercise session after pressing the Safety Stop, press <Clear Display>.*

7. Select treadbelt direction using the Treadbelt Direction <Forward> or <Reverse> keys.

8. Press <Start> to enable treadbelt movement.

9. Use the Speed <+> and <-> keys to adjust the speed to the desired level. The speed will immediately respond to your input so be sure to inform the patient that the treadbelt will begin to accelerate or decelerate. Gathering of data begins immediately at the point from which the treadmill begins to move in either forward or reverse direction.

10. If incline or decline is desired, use the Elevation <+> or <-> keys to set the grade at which you wish the exercise to begin.

11. Press <Stop> to stop the treadmill at any time while still retaining all current data on the display screen.

    AVERTISSEMENT: *Appuyer toujours sur la touche ARRET pour interrompre un exercise en cours. Ne pas appuy er sur la touche ATTENTE anant I'arrét complet du tapis. La touche ARRET antraíne une décélération progressive et toutes les données sont sauvegaardées. Si on était à appuyer sur la touche ATTENTE, non seulement on perdrait les données mais ela entraínerait aussi un arrét brutal du tapis.*

    CAUTION: *Always press <Stop> to stop the treadmill when patient exercise is in progress. Do not press <On/Standby> to clear the system of data until the treadmill belt has completely stopped moving. The <Stop> key will cause the*
    treadmill to ramp smoothly to a stop, all display data will be retained. Pressing <On/Standby> will clear all data from the display and stop the treadbelt more abruptly.

12. Press <Clear Display> to clear display data and reset settings to their default values.

13. At the end of the day, turn OFF power to the treadmill using the ON/OFF switch located on the left side of the front base.

NOTE: *BELT MOVEMENT WHILE AT ZERO SPEED*
Inherent "belt creep" is common with Pulse Width Modulation Motor Control. Allow the treadmill sufficient time to "warm up" prior to making any adjustments for belt creep. See "Zero Balance Adjustment" later in this chapter for instructions on this adjustment.

CHANGING MEASUREMENT UNITS

The Biodex RTM 400 can be configured to display either standard English or Euro (metric) measurements. To change measurement units:

1. Turn the treadmill OFF and then ON.
2. While the LED's on the front panel are lit, press <Stop> and the <Elevation +> key simultaneously.
3. Depress the <Set Time +> key and units will toggle from Euro (Metric) to English.
4. Once the desired units have been selected, press <Start> to save the new value.

ZERO BALANCE ADJUSTMENT

This option is used to correct treadbelt "creeping" which may occur at the zero speed setting due to changes in temperature, heavy use, etc.

1. Turn the treadmill OFF and then ON.
2. While the LED's on the front panel are lit, press <Stop> and <Forward> simultaneously. The display window should now show a "Creep Adjust-ment Setting" of between 1 and 16. The factory preset default value is 8.
3. Use the <Set Time> or <Set Weight> key to increase or decrease the Creep Adjustment Value. Lower the value for reverse direction, raise the value for forward direction.
4. Once the treadbelt has stopped creeping, press <Start> to save the new value.

USING THE RS-232 COMPUTER INTERFACE PORT

The RTM 400's Remote RS-232 Serial Port can be configured through hardware jumpers on the display circuit board as follows:

1. RS-232 for single treadmill with single host PC COM: Port
2. RS-422 for multiple treadmills attached to a single PC COM port.

- Treadmills are connected with a single "daisy chained" cable. A multi-drop protocol is used.

- 9 PIN D Connector: PIN 2 is XMIT, PIN 3 is RCV, PIN 5 is GND 9600 BAUD, no parity, 8 data bits, full duplex (See Assembly & Schematic Section for RS-232 Communications Cable diagram)

Protocol

The host PC will be the master and initiate all commands. The RTM 400 should process and acknowledge each command immediately.

Command (from host):	Description	Response (to remote host)
F0H to FFH	Reserved for multi-drop device addresses if selected	
9FH	Who are You	96H, ASCII 4 Single RTM3plus (RS-232) 96H, ASCII 5 Multiple RTM3plus (RS-422) 96H, ASCII 6, RTM3
9EH	Firmware Version	9EH, ASCII II "VER_X.XX..." terminate with NUll = 00H.
80H	Start Treadmill	80H to acknowledge
81H	Stop Treadmill	81H to acknowledge
82H,ASCII 3 digits	Set Treadmill Speed	82H to acknowledge
83H,ASCII 2 digits	Set Treadmill Elevation	83H to acknowledge
84H,ASCII F or R	Set Belt Direction	84H to acknowledge
85H,ASCII 3 digits	Set Weight	85H to acknowledge
86H,ASCII 4 digits	Set Time	86H to acknowledge

Request RTM Status:	Description	Response (to remote host)
A0H	Read Present Speed	AOH, ASCII 3 digits
A1H	Read Present Elevation	AIH, ASCII 2 digits
A2H	Read Present Belt Direction	A2H, ASCII F or R
A3H	Read Time	A3H, ASCII 4 digits
A4H	Read Distance	A4H, ASCII 4 digits
A5H	Read Calories	A5H, ASCII 4 digits
A6H	Read METs	A6H, ASCII 4 digits
A7H	Read System Status	A7H, 3 hex bytes Comm. Status Byte System Status Byte 1
B0H	Send one complete packet of status	Send "A1H - AFH"
BIH	Send status continuously	
B2H	Read Set Time	B5H,ASCII 3 digits
B3H	Read Weight	B7H,ASCII 3 digits

If an invalid command is received from the HOST, the peripheral should respond with AFH for NACK. Invalid commands are defined as:

- illegal command code
- unexpected data byte (not proceeded by appropriate command)
- new command received before previous data transmission completed
- data transmission not completed within specified time limit
- H/W ACIA error, i.e. overflow, frame error, etc.

Each peripheral should have a Communications Status Byte as follows:

Remote Communication Status:
(See diagram on page 41)

Bit 0	1 - ILLG	illegal command code
	0 - OK	
Bit 1	1 - UNEXP	unexpected data byte (not proceeded by appropriate command)
	0 - OK	
Bit 2	1 - NEW	new command received before previous data transmission completed
	0 - OK	
Bit 3	1 - TIME	data transmission not completed within specified time limit
	0 - OK	
Bit 4	1 - COMERR H/W ACIA	error, i.e., overflow, frame error, etc.
	0 - OK	
Bit 5	1 - HWFLT	system hardware fault is disabling function or system is in diagnostic mode
Bit 6	1 - RANGE	data out of range
	0 - OK	
Bit 7	0	data transmission, B7 MUST BE ZERO!

System Status Byte 1:
The lower control board error codes:

Bit 0	No Hall Effect Speed Signal
Bit 1	Hall Effect Overspeed Error
Bit 2	Tach Overspeed Error
Bit 3	No Speed From Tach
Bit 4	Grade Potentiometer Out of Range
Bit 5	Amplifier Fault Detect
Bit 6	Safety Lanyard Pulled Off
Bit 7	Communication Fault

5. MAINTENANCE

Your Biodex RTM 400 should provide trouble-free operation as long as the following maintenance procedures are performed. Automatic prompts will appear when specific hours of usage are reached (see chart below).

NOTE: *Without proper maintenance, excessive wear to drive components will occur. To assure trouble-free operation, scheduled maintenance must be performed. Failure to adhere to the scheduled maintenance chart below will void your warranty.*

INSTRUCTION	HOURS OF USAGE	LED DISPLAY CODE
Lubricate Deck	75	P1
Reverse Deck	1,000	P2
Belt Replacement	1,000	P3
Clean Motor and Amp	750	P4
Front Roller Cleaning	375	P5

NOTE: *Once the required maintenance has been performed, the RTM 400 maintenance prompt can be cleared by pressing <Select Display> twice, followed by <Clear Display> twice. The Maintenance Hour Log for the specific prompt displayed will reset to zero.*

GENERAL MAINTENANCE

Daily Maintenance
As required, clean all exterior surfaces, upholstery and restraining straps. Specialized vinyl cleaners or protectants are recommended for upholstery and cushions. Otherwise, use a solution of warm water and mild detergent.

NOTE: *DO NOT use solutions containing ammonia.*

Hardware computer components should be wiped clean as needed using a soft rag dampened with alcohol.

Quarterly: Lubricate Treadbelt and Slider Deck
The Biodex Lubricant Kit is designed to reduce friction between the treadbelt and the slider deck. It is required for all institutional treadmills. Proper and timely application of the lubricate will prevent premature failures due to excessive wear and load. Items affected by inadequate lubrication are the treadbelt, slider deck, motor, and motor controller.

Annually or Every 1,000 Hours: Reverse Exact-Track Bed
Reverse the Exact-Track bed. The treadmill bed is double sided, allowing it to be reversed and used over. Once both sides have been used, the bed must be replaced.

Annually or Every 1,000 Hours: Replace Treadbelt
Inspect treadmill for cracks or tears. If none are found, continue to use. If any cracks or tears are apparent, replace treadbelt.

MAINTENANCE PROCEDURES

Treadmill Lubrication (See Figure 8.)

1. Squirt one full pipette of the lubricant underneath the center of the treadbelt.
2. Walk 10 steps on the treadmill at a speed of 1.0 mph. This will moisten an 8" track underneath the center of the entire treadbelt.
3. Allow the treadmill to dry for approximately 10 minutes.

NOTE: *Use only the Biodex lubricant kit with your RTM 400. Most standard greases, waxes and silicon sprays will build up on the rollers, causing belt slippage and affecting tracking.*

To re-order lubricant kit, use Biodex part # 945-276. Each container provides 12 applications.

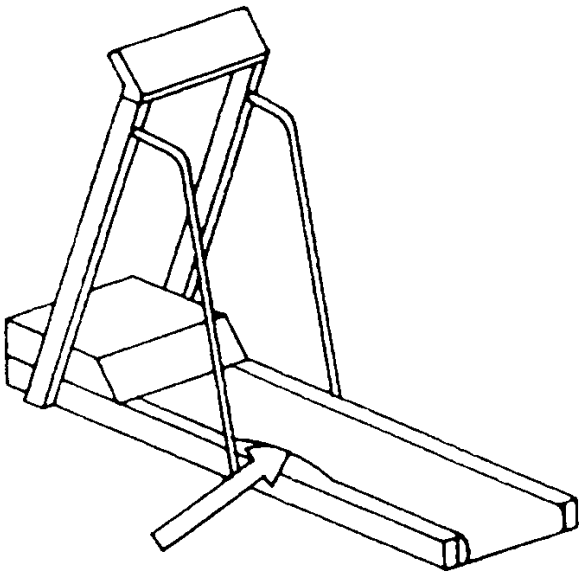


Figure 8. Squirt one full pipette of lubricant between the belt and deck.

Reverse or Replace Treadbelt and Deck

Tools Required: Phillips Screwdriver, 9/16 Socket, 3/16 and 5/32 Allen Wrenches

1. Elevate treadmill to 10 degrees, allowing access to the underside of the treadmill.
2. Remove power cord from wall outlet.
3. Remove motor cover secured by the six Phillips head screws. Once screws are removed, lift and remove cover.
4. Remove motor tension lock nut, located on the underside of accessory pan. The nut is attached to the motor bracket tensioning bolt. Once the tensioning bolt has been removed, lift the motor up and remove motor drive belt.
5. Remove the two aluminum traction strips, located one on each side of running deck. These are secured by four Allen screws located on top of traction strips.

6. Remove rear treadbelt roller. The roller is secured by two treadbelt tensioning bolts. Once bolts have been removed, lift out the roller assembly.
7. Remove the two Allen screws which secure the front treadbelt roller. The screws are located on the side of the treadmill.

⚠ ***ATTENTION:*** Si les boutons de sécurité du rouleau sont retirés, le rouleau chutera. Ne oas oublier que les rouleaux sont lourds.

⚠ ***CAUTION:*** *When the bolts securing the roller are removed the roller will drop. Be aware that the rollers are heavy.*

8. Remove the running deck. This is done by lifting from the side of the deck and raising the deck two inches before sliding it out. The running deck is two sided and can be flipped over and reused once.
9. To remove the treadbelt seven support brackets must be removed. These are comprised of three angle iron brackets attached by securing nuts, and four running deck support bars secured by Allen screws. Once all support brackets are removed the treadbelt can be removed.
10. Tension treadbelt and adjust tracking after you reassemble the treadmill. (See Treadbelt Adjustment procedure.)

Treadbelt Adjustment

Although the RTM Treadmill incorporates the "Exact Track System," occasional belt adjustments are still necessary for correct tensioning and tracking.

Tension Adjustment

⚠ ***ATTENTION:*** *Avant de tester la tension du tapis selon la procédure décrite ci-dessons, méttre le tapis à l'arrêt et déconnecter le câble secteur. Certaines piéces du tapis peuvent entrainer des blessures graves. Ne jamais essayer de déterminer la tension sur le tapis pendant que ce dernier est en mouvement.*

⚠ ***CAUTION:*** *Before testing treadbelt tension as described below, turn the treadmill OFF and unplug the system. Moving parts on the treadmill can cause serious injury. Do not attempt to determine treadbelt tension while the belt is moving.*

The need for tension adjustment is indicated by uneven belt speed or the belt stopping suddenly upon foot impact. Properly tensioned, the treadbelt will allow the user to slip a hand snugly under the center of the belt.

Treadbelt tension is adjusted by tightening or loosening the two hex-head, 9/16, bolts at the end of the treadmill frame. The bolts should be adjusted in 1/4-turn increments, exactly the same amount, in the same direction. Turn both bolts clockwise to tighten the belt. Turn both bolts counterclockwise to loosen the belt. Failure to turn both bolts equally may affect tracking. One quick test is to apply hand heel strikes and observe if belt momentarily stops.

If belt speed remains constant, this indicates belt is tight. If belt hesitates during heel strikes, additional tightening is required. To check over tightening, set treadmill .5 mph and, while holding rail, resist until belt stops. If drive roller continues to rotate with the belt stopped, further adjustment is not necessary. If drive roller stops when belt is stopped, belt is too tight. Loosen belt and recheck.

Tracking
Tracking adjustment is necessary when a pronounced bump appears toward the left side of the belt, approximately two inches from the left edge. This occurs when the belt works its way out of the Exact-Track grooves.

To Adjust Treadbelt Tracking:
Tighten the hex tensioning bolt on the side to which the treadbelt has migrated, turn bolt in 1/8 increments clockwise. The treadbelt should slowly move away from the tightened bolt. Once belt migrates back into roller slot the bump will disappear. At this point, fine tracking adjustment is necessary.

Fine Tracking
Fine tracking adjustment prevents premature wear of the tacking belt rib which rides in the Exact-Track groove. The belt rib should be centered in the tracking groove. If the rib rides against the groove wall, a friction point forms causing excessive wear. This adjustment should be made during preventative maintenance or during belt replacements.

To Adjust Fine Tracking:
Determine which side of the exact track groove the belt rib is riding on. Mark treadbelt tracking position on deck.

Tighten the hex tensioning bolt on the side the belt is tracking against, belt should migrate to the opposite side of the groove. Mark the treadbelt tracking position on the deck. You now have two marks on the deck 1/4" apart. Mark the center position of the marks. This is where the belt should track. Adjust 9/16 tensioning bolt so that the belt is centered on the mark. Remember the belt will migrate away from the tension bolt that is adjusted last. Tracking adjustments are done in forward direction only, at 8 mph.

Check tensioning after adjustment to insure proper belt performance and wear.

NOTE: *Motor drive belt should never slip. Check this when you check for tread belt overtightening. If tread belt drive roller is stopped, motor should also stall. If motor turns, but drive roller is stopped, tighten motor tension bracket located under the mill. Adjust until the motor belt stops slipping.*

6. TROUBLE-SHOOTING

SYMPTOM
Treadmill is turned ON and speed control is inoperable (belt not moving).

1. Check for faults on display unit before moving onto step #2:

CODE	DESCRIPTION
A1	Motor Amplifier Fault
A2	Upper Board NV Ram Failure
A3	Upper Board PROM
A4	Upper Board RAM
A5	Upper Board Communication Failure RS-232
A6	Upper Board Communication Failure RS-422
A7	Lower Board PROM
A8	Lower Board RAM
A9	Not Used
b1	Lower Board Watchdog Failure
b2	Lower Board Watchdog Disabled
b3	Lower Board Controller Fault
b4	Hall No Speed
b5	Hall Over Speed
b6	Lower Board Loopback Comm Failure
b7	Upper Board Failure
b8	Not Used
b9	Not Used
E1	Grade Failure
P1	Deck Lubrication Maintenance
P2	Reverse Deck Maintenance
P3	Belt Replacement Maintenance
P4	Motor & Amp Cleaning
S1	Tach Overspeed
S2	Tach No Speed

2. If no faults are displayed, check the following:

   - Large blue capacitor should measure 170 VOL across terminals. If OK, proceed to step 3.

3. Speed control signal on motor amplifier should measure .250 VDC per mill per hour E.G.

   NOTE: *Measurement taken at J1, PIN 1 to PIN 2 (ground)*

   1mph = .250 VDC
   2mph = .500 VDC
   4mph = 1.00 VDC
   8mph = 2.00 VDC

   If speed control signals are OK, proceed to step 4.

4. Check Amplifier Output. The Output Terminals are located on top of amplifier and are designated “m+” and “m-”. The Output voltage should be:
   1mph = 32 VAC, 2mph = 52 VAC

   NOTE: *Remember to use the volts A.C. selection on your meter. The Amplifier is pulse width modulating, therefore, A.C. scale is required.*

   If amplifier output is OK, proceed to step 5.

5. Check Motor Resistance. The motor has a winding resistance of 1.3 to 3 Ohms. The value is dependent on commutation position. If resistance reading is significantly higher the windings or brush contacts are defective.

   To measure resistance turn treadmill power OFF. Place meter lead across terminals marked “m+” and “m-”. Set meter scale to the lowest resistance selection. Check resis tance in several commutator positions by rotating motor shaft 9.0 degrees for every one revolution.

7. SYSTEM DIAGNOSTICS

In the unlikely event of a system malfunction, the following tests may be helpful in pinpointing the problem source.

BUTTON TEST
This will test the functionality of the 14 buttons on the display panel. Listed below is the button designation and the display window codes displayed during key activation.

To activate the button test turn unit OFF then ON. While all LED's are lit press <Stop> and the <Elevation -> buttons simultaneously. All LED's should go OFF. If an error code is displayed note error and call Biodex Technical Support for assistance. To test individual buttons use chart below.

Depress each button to ensure proper operation. As each button is depressed there should be a corresponding beep.

BUTTON DESIGNATION	DISPLAY WINDOW
Select display	1
Clear display	2
Set weight	3
Set time	4
Scroll up	5
Scroll down	6
Speed up	7
Speed down	8
Grade up	9
Grade down	10
Forward	11
Reverse	12
Stop	13
Start	14

MOTOR CURRENT TEST
The test verifies that the system is operating under normal motor current levels. A contributing factor is excess motor current is proper maintenance. As the friction between the running deck and belt increases so does motor current. Listed below are typical current levels at specific speeds.

To activate motor current test turn system OFF and then ON. While all LED'S are lit depress <Stop> and <Speed -> buttons simultaneously. Using the <Speed> buttons select speed as listed below to verify motor current values. If motor current value varies by more than 20% refer to the maintenance section of the manual. If after maintenance is performed motor current value continues at 20% above listed value, contact Biodex Technical Support for assistance.

SPEED	MOTOR CURRENT (AMPS)
8.0	2.0
5.0	1.4
0.0	0.4
-3.0	1.2

8. OPTIONAL

HANDRAIL INSTALLATION (OPTIONAL)

The Biodex RMT 400, RTM 600 and Gait Trainer 2 each come with a sturdy support bar installed. If desired, customers can install optional Standard Handrails or Geriatric/Pediatric Handrails. Both optional handrail sets are installed as follows:

INSTALLATION PROCEDURE

(Refer to Figures 9- 12.)

1. Using a Phillips screwdriver, remove the two screws that attach the cover plate to side of the display support bar. Set the screws and mounting plates aside.
2. Using a 9/16-inch box wrench, attach the optional handrail to the display support bar with a 3/8-inch lock washer and hex head bolt (leave loose).
3. Insert the handrail mounting bar through the bottom opening of the handrail. Rotate the mounting bar so that it is aligned with the Allen screw holes and the counter sunk side is facing out from the treadmill deck. This will prevent the 1/4-20 socket head Allen screw from protruding outside of the handrail.
4. Attach the bottom of the handrail to the platform deck frame using two 1/4 - 20 x 1.75-inch socket-head screws (leave loose).
5. Using one 1/4 - 20 x 1.75-inch button-head screw, secure the optional handrail to the support bar. Pass the screw, threads to the outside of the deck, through the support bar first and into the optional handrail.
6. Tighten all screws.
7. Using a Phillips screwdriver, replace the cover plate on the display support bar with the two screws set aside in step #1.
8. Repeat the procedure to attach the opposite optional handrail.

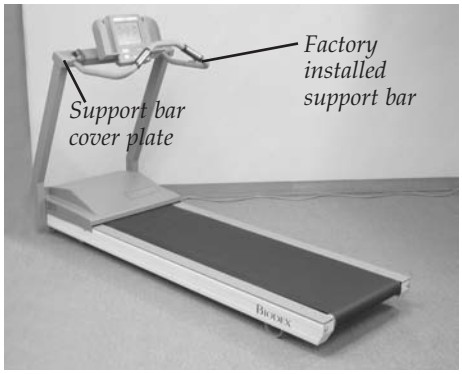
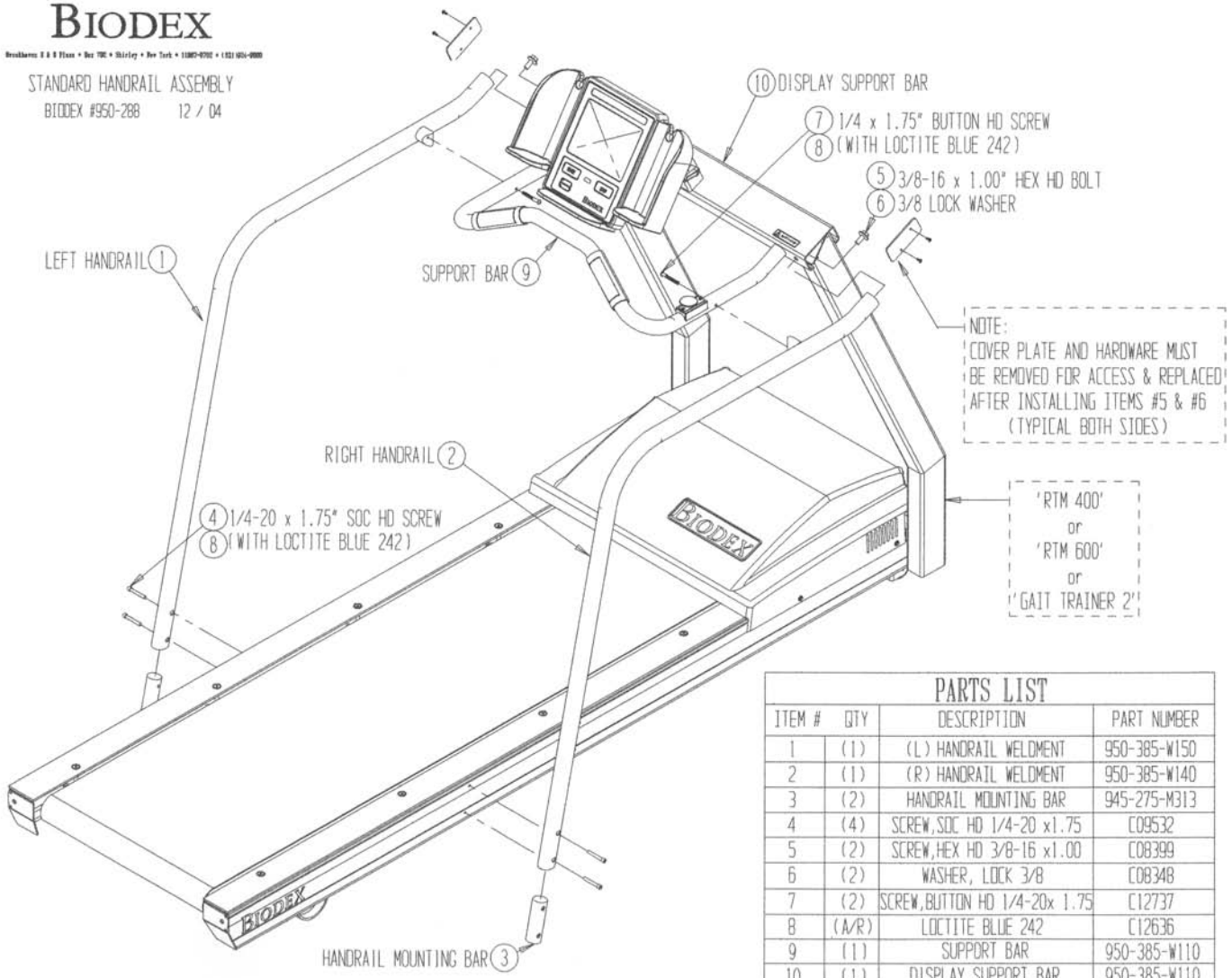


Figure 9. The RTM 400, RTM 600 and Gait Trainer 2 all come with a factory installed support bar.

Figure 10. Optional Standard Handrails installed.

Figure 11. Optional Geriatric/Pediatric Handrails installed.



PARTS LIST

ITEM #	QTY	DESCRIPTION	PART NUMBER
1	(1)	(L) HANDRAIL WELDMENT	950-385-W150
2	(1)	(R) HANDRAIL WELDMENT	950-385-W140
3	(2)	HANDRAIL MOUNTING BAR	945-275-M313
4	(4)	SCREW,SOC HD 1/4-20 x1.75	C09532
5	(2)	SCREW,HEX HD 3/8-16 x1.00	C08399
6	(2)	WASHER, LOCK 3/8	C08348
7	(2)	SCREW,BUTTON HD 1/4-20x 1.75	C12737
8	(A/R)	LOCTITE BLUE 242	C12636
9	(1)	SUPPORT BAR	950-385-W110
10	(1)	DISPLAY SUPPORT BAR	950-385-W110

Figure 12. Handrail installation.

9. CALIBRATION VERIFICATION

This option allows you to verify and calibrate both speed and incline. To activate calibration verification turn unit OFF and then ON. While all LED's are lit press <Stop> and <Speed +> simultaneously.

To verify speed press <Speed> buttons and select a range of speeds from 1 mph to 10 mph. The speed display window and selectable display should correspond. If there is a difference, call Biodex technical Support for assistance.

To verify elevation press <Elevation +> button until incline stops. The selectable display window should read between 120-128. Press <Elevation -> button until decline stops. The selectable display window should read between 11-15. If the values displayed are not within the ranges specified call Biodex Technical Support.

To exit calibration verification depress <Start> for normal operation.

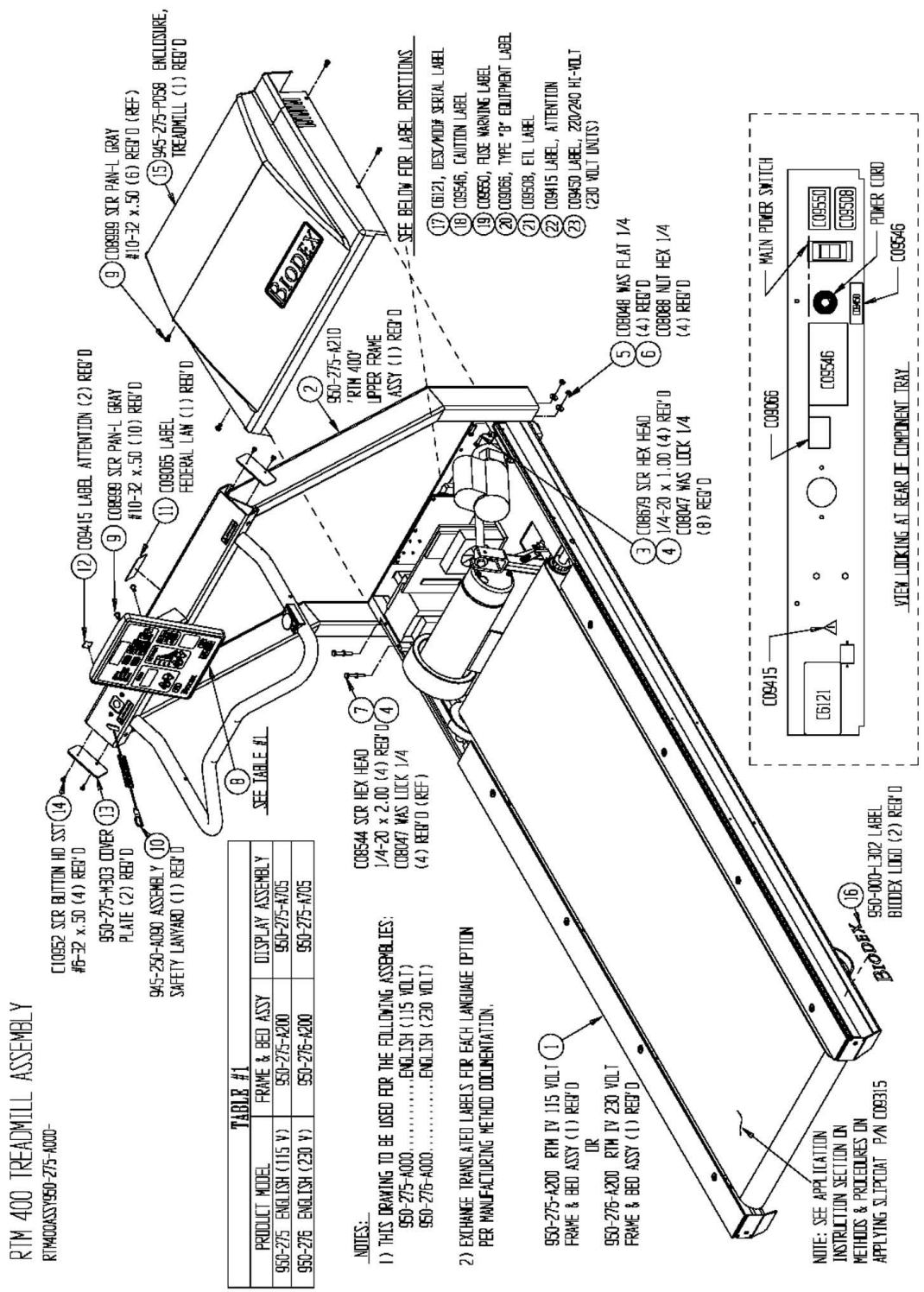
10. REPLACEMENT

Item Number	Description
ELECTRICAL	
945-200-E350	PWM Motor Controller (RTM)
945-250-E700	Treadmill Chassis Harness
945-275-E700	Display Cable Assembly
945-250-E702	115 Volt Actuator Assembly
945-250-E733	Power Cord, Euro
945-250-E703	Power Cord Assembly
945-250-E704	Hall Effects Cable Assembly
945-250-E708	Pulse Width Mod. Cable
945-250-E709	Lanyard Reed Switch Cable
945-250-E711	Position Potentiometer Assy
945-250-E712	Drive Motor with Tach (w/o flywheel)
945-275-E825	Hall Effects PC Board Assy
945-275-E101	Membrane Switch Overlay (LED)
MECHANICAL	
C08304	Isolation Transformer
C09456	Relay, Solid State (IEC)
C09102	Circuit Breaker Assy
C09001	Magnetic Sensor
C08986	Poly-V Belt “Type J”
C08992	1 x 2” Dia. Wheels
C08983	Vibration Mounts
945-250-M041	Treadmill Belt
945-250-M036	Bed “Double Groove”
945-275-M314	Rear Foot Brackets
945-275-P058	Enclosure Housing RTM 400
ASSEMBLIES	
945-275-A010	Front Roller Assembly
945-275-A020	Rear Roller Assembly
945-250-A090	Safety Lanyard Assembly
945-275-A320	Drive Motor/Flywheel Assembly
945-275-A700	Display, Assy, RTM 400
945-250-A720	Control PC Board Assembly

11. SPECIFICATIONS

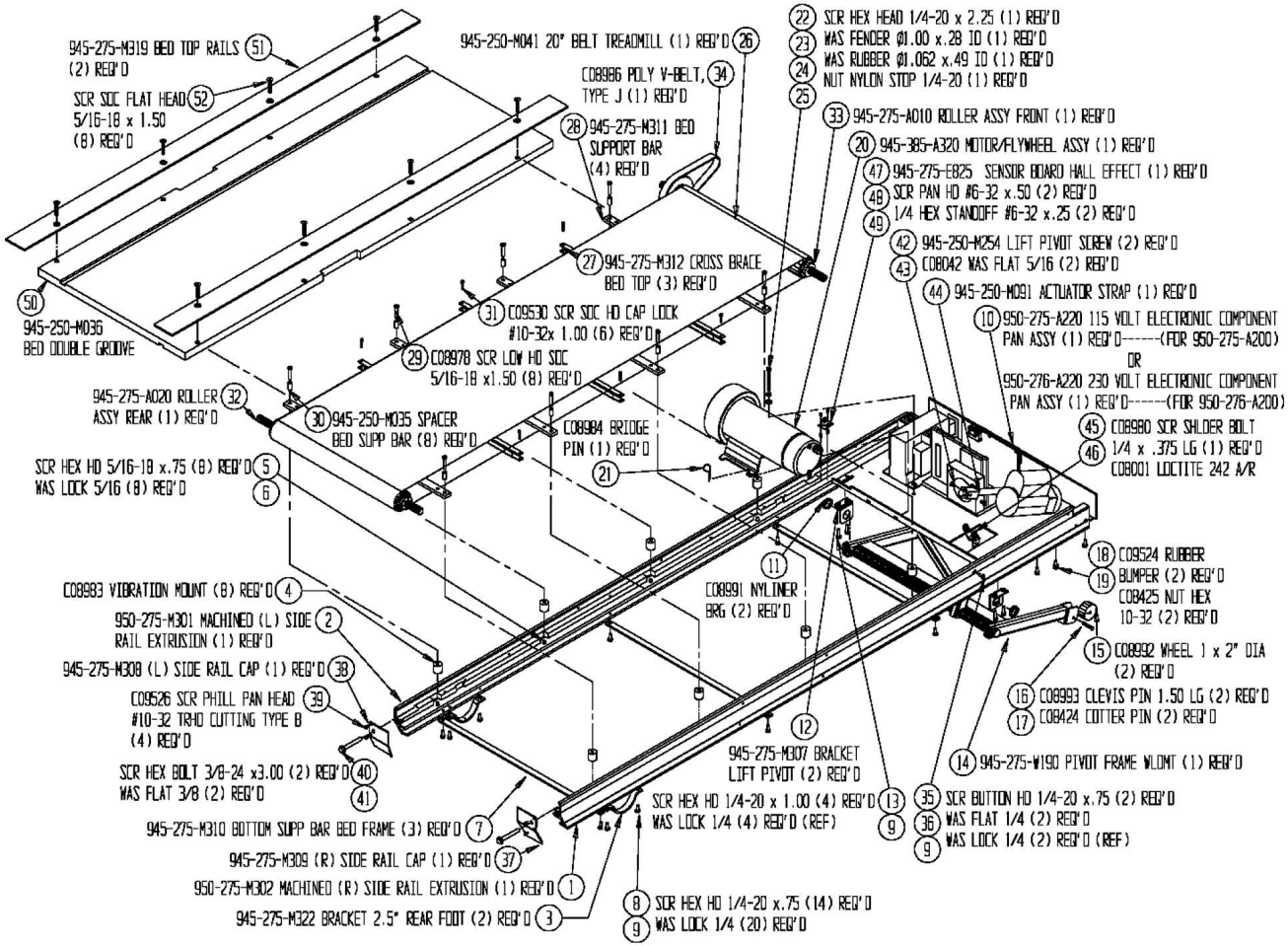
Dimensions:	27" w x 86" h (69 x 218 cm).
Weight:	310 lb (140 kg).
Motor:	2 HP with 4Q-Pulse Width Modulation Control.
Speed Range:	Forward 0-10 mph (0-16.9 km/h), Reverse 0-3 mph (0-4.8 km/h) in .1 mph (.16 km/h) increments.
Elevation:	0-15% grade or -3 to 12% grade (optional for RTM 500 only).
Running Area:	20" x 64" (51 x 160 cm).
Deck:	1" (2.5 cm) Reversible Teflon™ Impregnated High Density Composite Fiber.
Electrical:	115 VAC, 20 Amp dedicated line (International voltages available) includes hospital grade plug with 12' (3.7 m) power cord.
Certifications:	ETL listed to U.L. STD. 2601 ETL© listed to CAN/CSA c22.2 no. 601.1-M90 CE conformity to M.D.D. 93/42/EEC specifications to meet all hospital requirements.
User Capacity:	Tested to 400 lb
Warranty:	2-years parts,1-year labor.
Mfg:	Biodex Medical Systems 20 Ramsay Road Shirley, NY 11967-4704
Classification:	Class I measuring, type B, ordinary equipment, continuous operation

12. ASSEMBLY DRAWINGS/SCHEMATICS



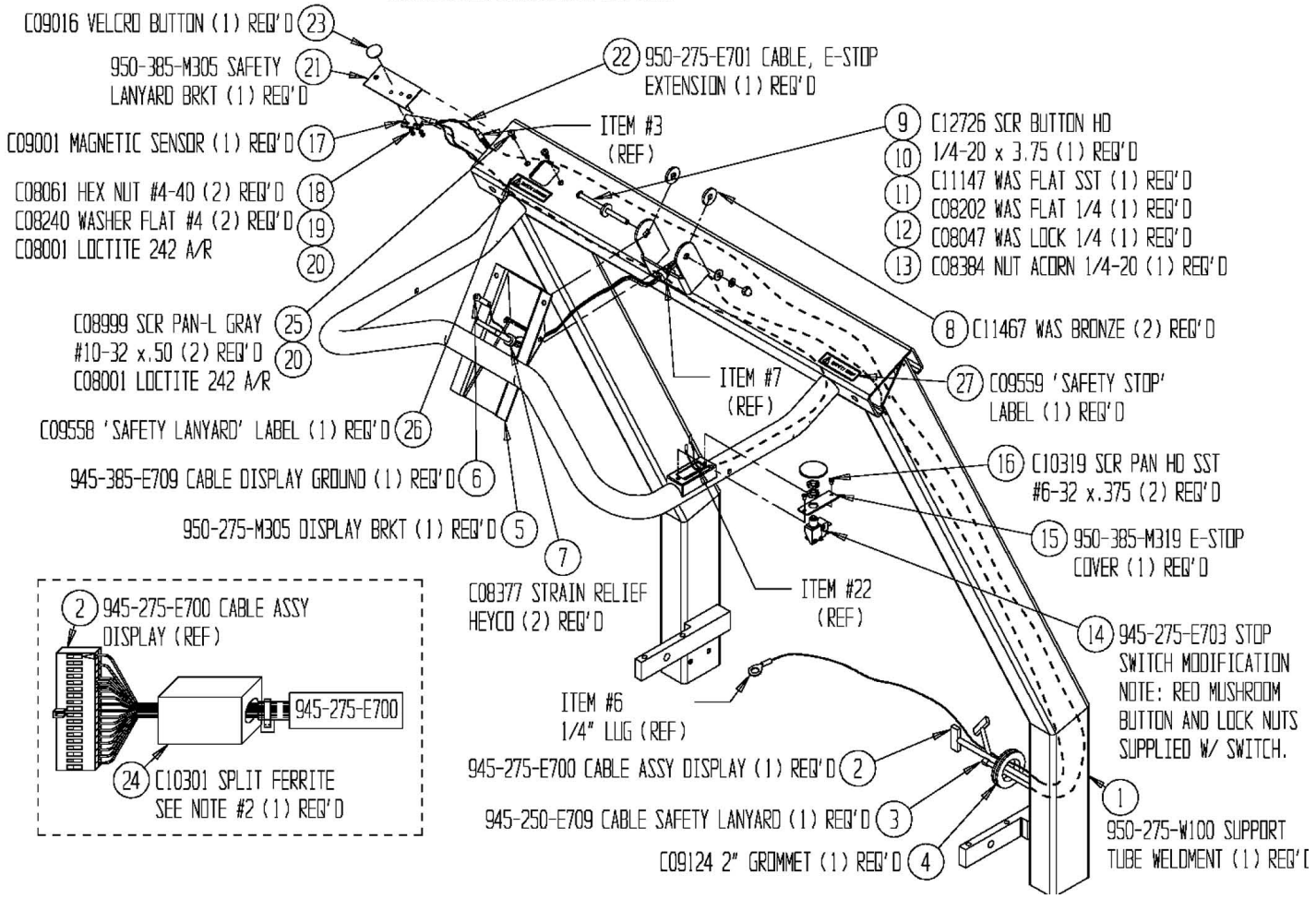
RTM 400 @ 600 FRAME @ BED ASS'Y

RTMFRAMeBEDASSY950-275-A200-



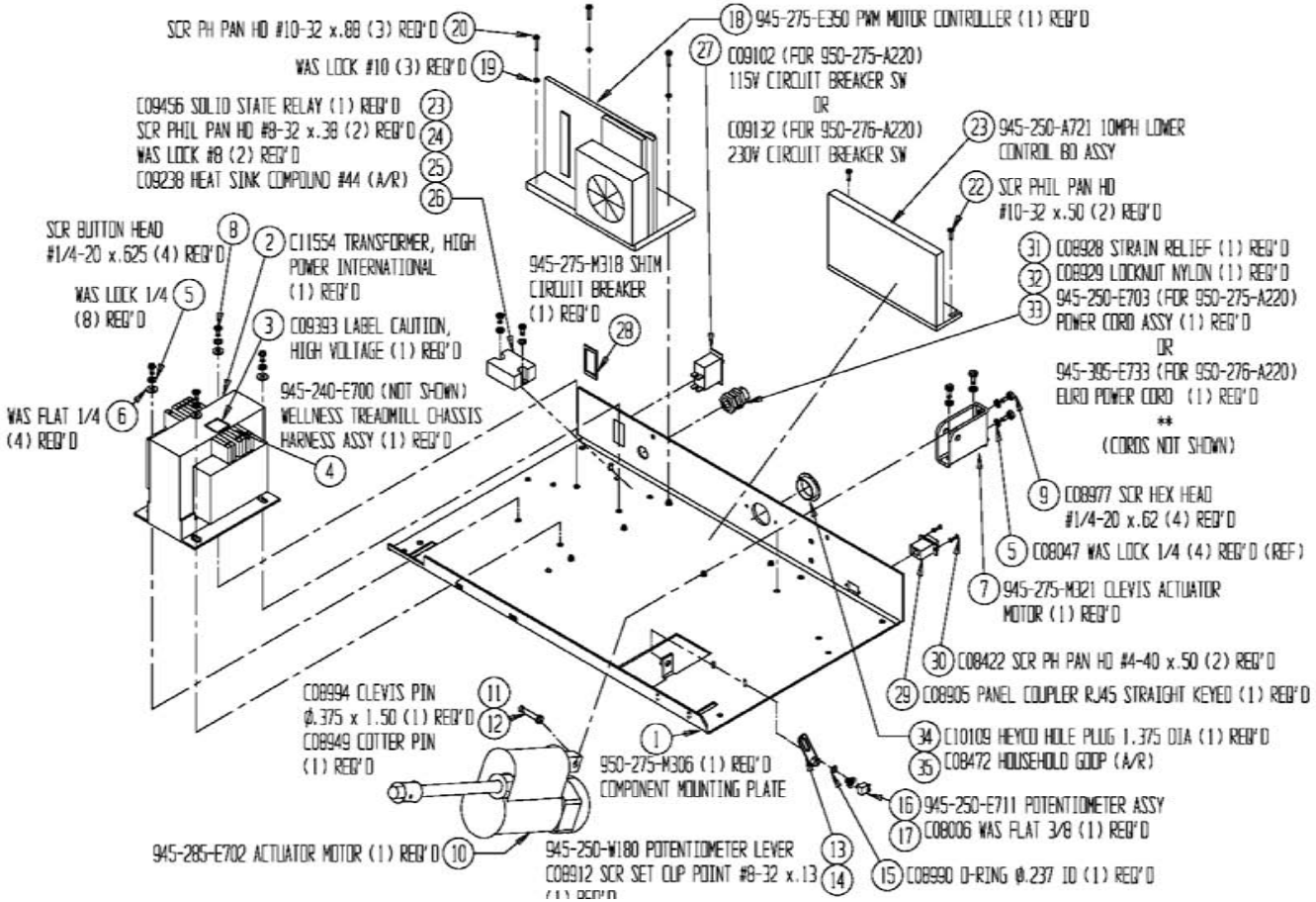
RTM 400 UPPER FRAME ASSEMBLY

RTM400UPPERFRAMEASSY950-275 A210-

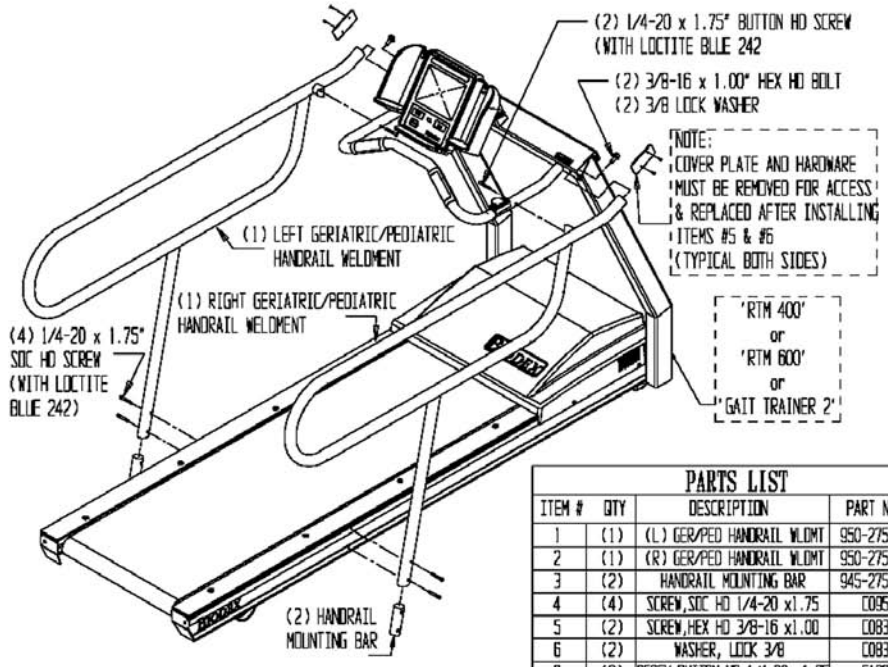


TREADMILL 115 / 230 VOLT
ELECTRONIC COMPONENT PAN ASSY

RTM 115,230VELECTCOMPPANASSY950-275-A220

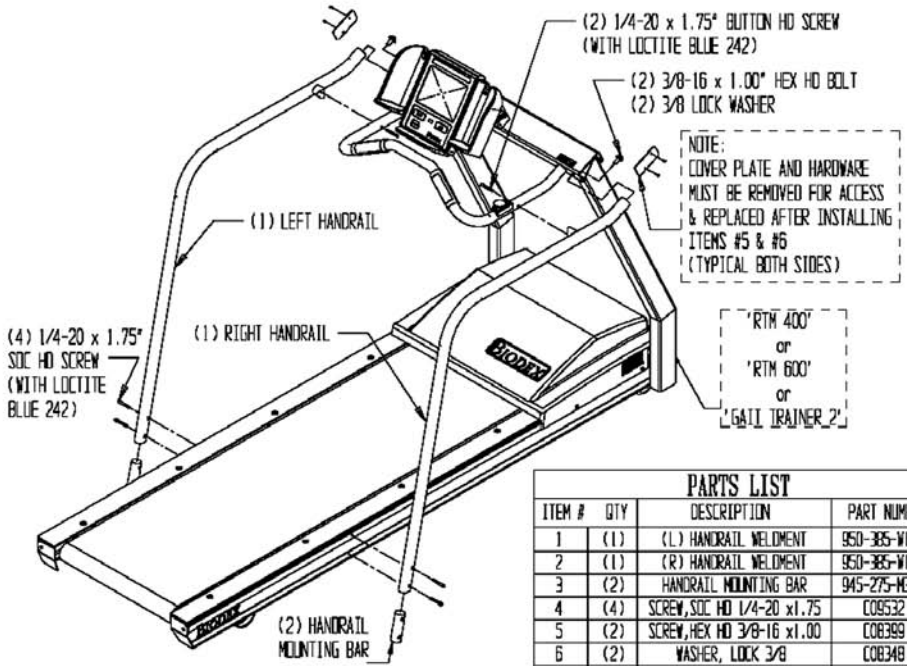


OPTIONAL GERIATRIC/PEDIATRIC HANDRAIL ASSEMBLY 950-287

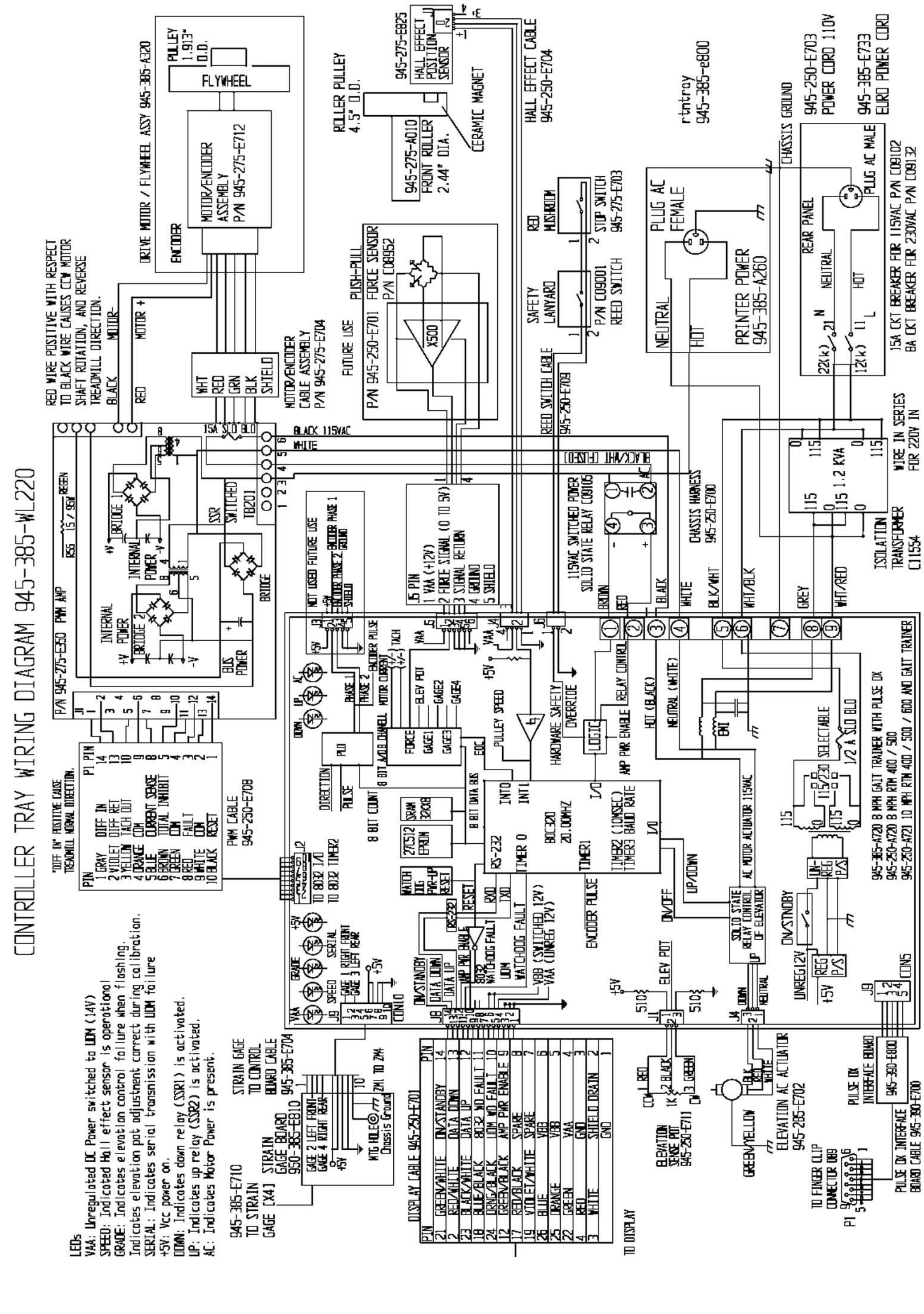


PARTS LIST			
ITEM #	QTY	DESCRIPTION	PART NUMBER
1	(1)	(L) GER/PED HANDRAIL WLDMT	950-275-W110
2	(1)	(R) GER/PED HANDRAIL WLDMT	950-275-W120
3	(2)	HANDRAIL MOUNTING BAR	945-275-M313
4	(4)	SCREW,SOC HD 1/4-20 x1.75	C09532
5	(2)	SCREW,HEX HD 3/8-16 x1.00	C08399
6	(2)	WASHER, LOCK 3/8	C08348
7	(2)	SCREW,BUTTON HD 1/4-20x 1.75	C12737
8	(A/R)	LOCTITE BLUE 242	C12636

OPYIONAL STANDARD HANDRAIL ASSEMBLY 950-288

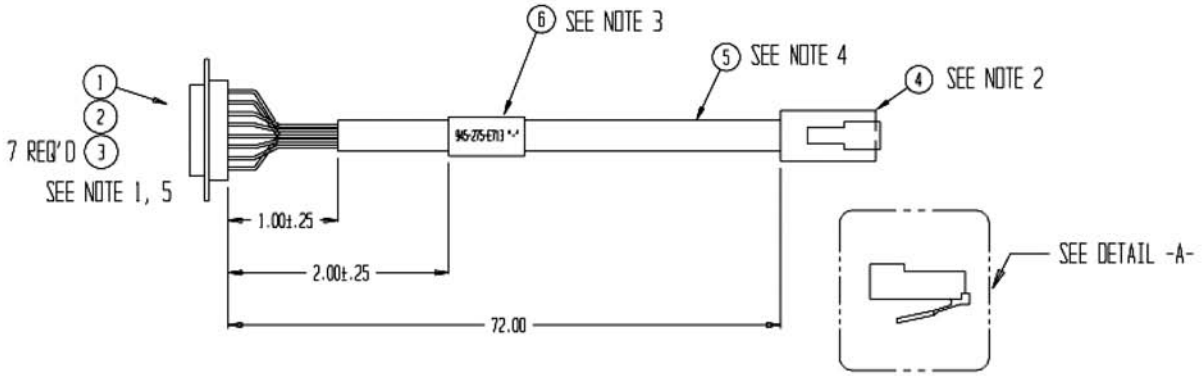


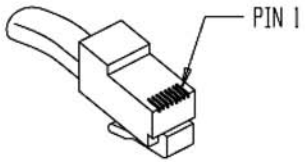
PARTS LIST			
ITEM #	QTY	DESCRIPTION	PART NUMBER
1	(1)	(L) HANDRAIL WELDMENT	950-385-W150
2	(1)	(R) HANDRAIL WELDMENT	950-385-W140
3	(2)	HANDRAIL MOUNTING BAR	945-275-M313
4	(4)	SCREW,SOC HD 1/4-20 x1.75	C09532
5	(2)	SCREW,HEX HD 3/8-16 x1.00	C08399
6	(2)	WASHER, LOCK 3/8	C08348
7	(2)	SCREW,BUTTON HD 1/4-20x 1.75	C12737
8	(A/R)	LOCTITE BLUE 242	C12636


CONTROLLER TRAY WIRING DIAGRAM 945-385-WL220

REVISIONS			
REV	ECO #	CHK BY	DATE
-	INITIAL RELEASE	RMP	04/05/06

INTERCONNECT TABLE		
ITEM 1	DESCRIPTION	ITEM 4
1		N/C
2	RXD	1
3	TXD	2
4	ITEM 1 PIN 6	N/C
5	GND	7
6	ITEM 1 PIN 4	N/C
7	ITEM 1 PIN 8	N/C
8	ITEM 1 PIN 7	N/C
9		N/C





DETAIL -A-
SCALE: NONE

NOTES:

1. WIRE TERMINATION AT ITEM #1, STRIP JACKET, ASSEMBLE AND CRIMP CONTACTS. INSTALL.
2. WIRE TERMINATION AT ITEM #3, STRIP JACKET, INSTALL INTO PLUG AND CRIMP
3. IDENTIFY LABEL WITH CABLE ASSEMBLY PART NUMBER AND REVISION LETTER.
4. NEWARK ELECTRONICS IS THE RECOMMENDED SOURCE FOR ITEM #4.
5. INSTALL ITEM 3, DB 9 SHELL AFTER WIRE TERMINATION IS COMPLETE.

ITEM	QTY	PART NUMBER	DESCRIPTION
6	1	PANDUIT #PDL-8-1	PANDUI, PAN-CODE, .80 X .50, SELF-LAM BLANK PIN FED LABEL
5	AR	GC ELECT #9945	MODULAR LINE CORD,(8) COND FLAT, 26 AWG, STRANDED, SILVER PVC JCK
4	1	AMP#5-554743-3	MODULAR PLUG, 8 POSITION, KEYED, RJ45/4 TYPE
3	7	AMP 66683-4	CONTACT, CRIMP TYPE, SOCKET
2	1	AMP 749914-2	DB 9 PLASTIC HOOD
1	1	AMP 205203-3	DB 9 FEMALE CONNECTOR TIN PLATE

MATERIAL: SEE ABOVE

FINISH: _____

EXCEPT AS NOTED

TOLERANCES:
X/X = ±1/16"
.XX = ±.015"
.XXX = ±.005"
ANGLES = ±1°

REMOVE ALL SHARP EDGES .01/.03 R OR CHAMFER

ALL FEATURES SHOWN PERPENDICULAR OR PARALLEL SHALL BE 50 WITHIN ±1°

SURFACE FINISH INDICATED BY AMERICAN STANDARD ASA B46.1-1962 GENERAL MACHINING 125

CONCENTRICITY: .005 TIR

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED

NEXT ASSY

BIODEX MEDICAL SYSTEMS INC.
Shirley • New York • 1-800-224-6339

TITLE: RTM 400 RS-232 COMMUNICATIONS CABLE

DR BY	DATE	PART #
RMP	03/04/06	945-275-E713

ENGR.	DATE	CHK BY	DATE	SIZE	SCALE	SHEET	REV
RMP	03/04/06	TR	03/04/06	B	NONE	1 OF 1	-

BIODEX

Biodex Medical Systems, Inc.

20 Ramsay Road, Shirley, New York, 11967-4704, Tel: 800-224-6339 (*In NY and Int'l, call 631-924-9000),* Fax: 631-924-9338, Email: sales@biodex.com, www.biodex.com

FN: 06-172 4/06