lyt_A - the service manual

November 4, 2005

Contents

introduction

Lyt_A is a tactile installation consisting of two cabinets, placed several metres apart. For stability the cabinets are attached to the floor of the building. A force feedback system installed in the structures gives the impression of touching 'at a distance'. The installation is computer controlled and pneumatically regulated. The two cabinets are linked through an ethernet cable patched through the floor.

As visitors touch the elastic surface of one cabinet, they can feel the 'taxels' (tactile pixels) moving away from them. Simultaneously, the visitors touching the other surface feel someone pushing the corresponding taxels outwards. The installation should be experienced mainly through touch, by leaning against the surface and slowly stroking or pressing the elastic membrane. The tactile impressions made by visitors touching the other wall are easily felt, but not always visible.

English edition

This is the English edition of the service manual for 'lyt_A'. Please note that where there is a discrepancy between the this edition and the German translation, the English edition should be taken as authoritative. However, if you do find any errors, please contact foam (see contact details).

general operation

Lyta requires diligent attention at both 'startup' and 'shutdown'. The sequences must be followed exactly, in order to guarantee continued operation. For optimal performance, lyta should be started up each morning the museum is open, and shutdown each evening.

startup

The startup sequence is several minutes long. Complete the following sequence for each of the two units.

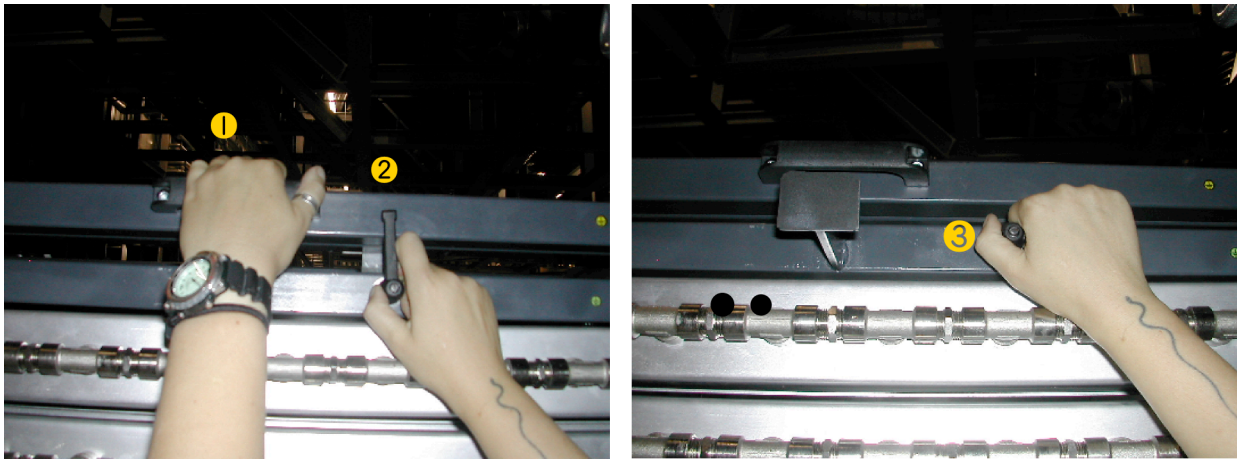
1. unlock and open glass doors.
2. close external frame by pulling the handle above the drawers towards you (picture 1 - part 1).
3. close latch tightly, by turning the handle to an upright position (picture 1 - part 2).
4. wait for orange 'standby' light to go off, and blinking lights on left to start blinking.
5. close and lock glass door.

shutdown

The shutdown sequence should happen each day, and is essentially the reverse of the startup procedure.

1. unlock and open glass doors.
2. unlatch using latch at the top of the frame (picture 1 - part 3).
3. release frame by pushing handle forwards.
4. the orange 'standby' light should go on (check frame is released if light does not turn on)
5. close and lock glass doors.

images



picture 1

periodic maintenance

cleaning

If the membrane is dirty, clean using a cloth soaked in whitesprits only [DO NOT clean using water, or detergents]. Clean the glass using standard glass cleaner.

weekly check

Once per week, while lyta is running, perform a quick visual check to see if any of the muscles are protruding too far from the membrane, if so press the rods to check if they retract. if the rod does not retract the muscle will need to be replaced.

monthly check

- repeat the weekly check.
- make sure the regulator is maintaining pressure at 5bar.
- check circuit-breaker (note that the computer needs several minutes to restart after a power cut).
- check the pressure switch is functioning. be prepared to cut the power if it doesn't turn off when the pressure drops below 4bar.

yearly check

The air filter will need to replaced after 1 year of operation. [see parts list].

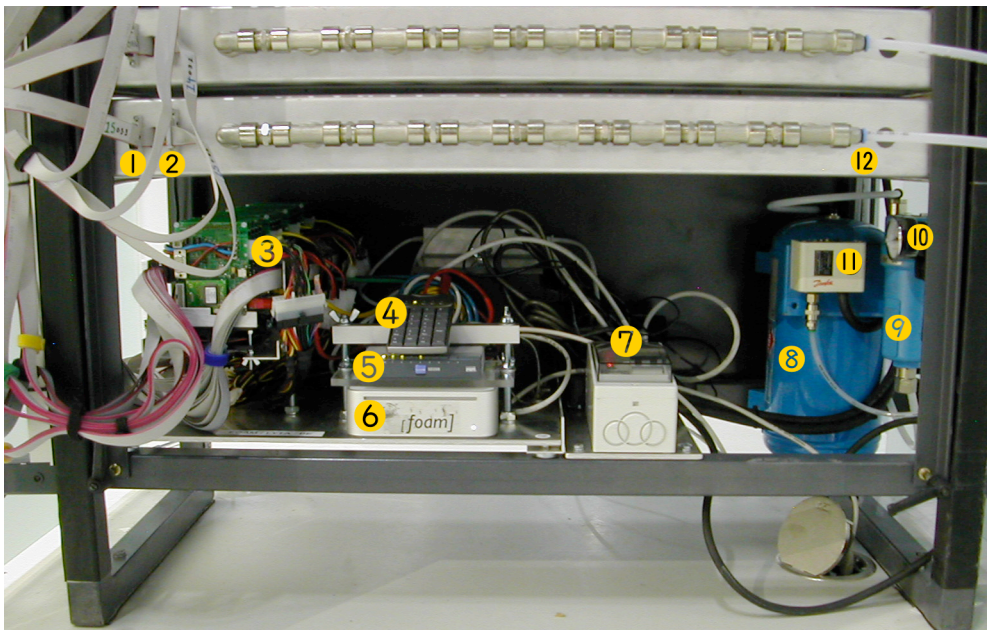
calibration

calibration must be performed after a muscle or drawer has been replaced. It may also be required after an extended period of use. For details see the section 'calibration of a replaced drawer'

troubleshooting

There are many interdependent parts, but relatively few points of failure. Most failures should be able to be identified from either the front panel [interface] or by the lights inside the unit [picture 3]. Most problems can be determined by a visual inspection.

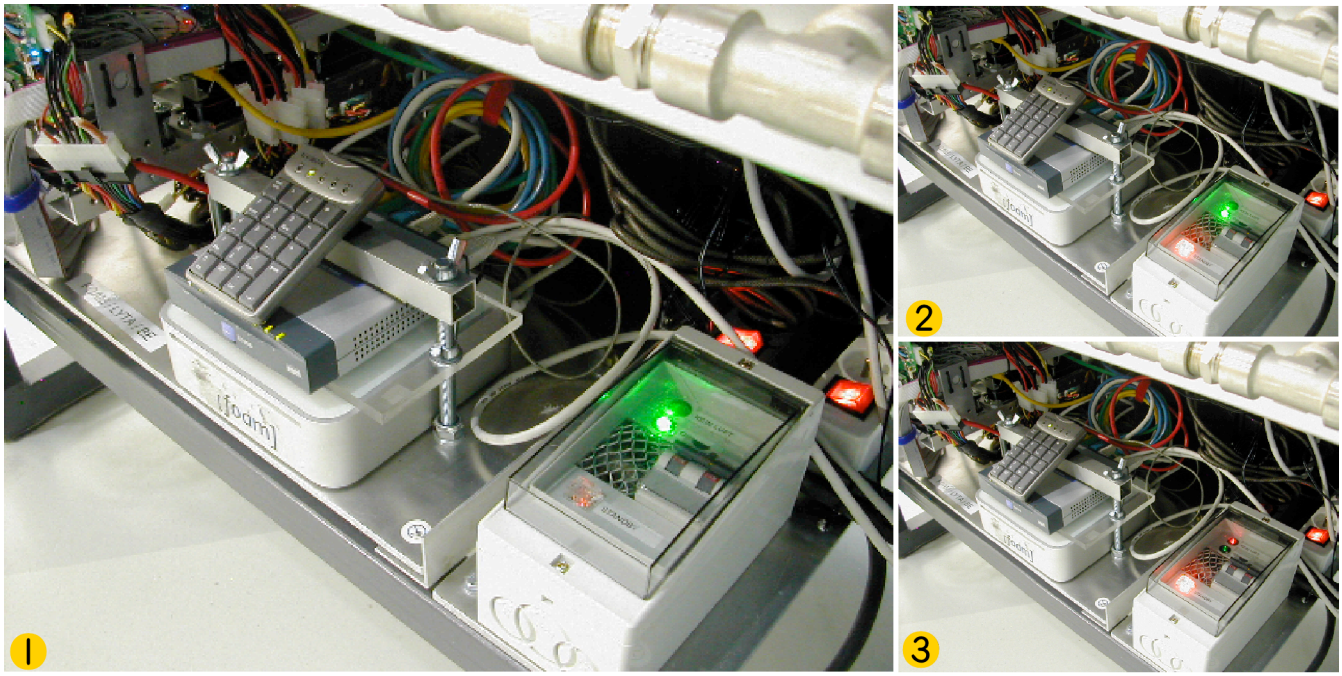
internal components



picture 2

1. sensor connector
2. muscle drive connector
3. control boards
4. number pad
5. network switch
6. computer
7. power assembly [including circuit-breaker]
8. air tank
9. regulator
10. pressure gauge
11. pressure switch
12. air hose to manifold connection

status lights



picture 3

1. standard operation [green light only]
2. standby mode, frame open [orange light]
3. low air pressure [red light] in standby mode [orange light]

changing membrane

The front membrane can be replaced as follows.

- remove the front Plexiglas [perspex] panel using a M6 hex driver
- remove each of the 'L' pieces holding the membrane frame in place using flathead screw driver
- slowly remove membrane frame.
- If the membrane is damaged, remove it from the frame by detaching the Velcro connectors.

replacing a single drawer

The pneumatic actuators are contained in drawers which are interchangeable. This enables damaged parts to be replaced without having to remove the complete exhibit.

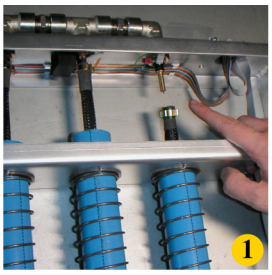
1. open glass doors (as explained in general operation)
2. turn off red air tap
3. leave it running until pressure switch turns off power [at around 4bar (picture 2 - part 10)]
4. remove air hose from the drawer by pushing in the blue ring. (picture 2 - part 12)
5. carefully remove sensor and drive connectors. (picture 2 - parts 1 & 2)
6. remove the 2 'L shape' restraints holding the drawers in place.
7. pull out drawer that needs repair, being careful not to snag the front caps.

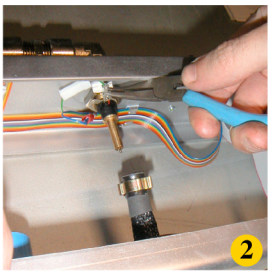
8. replace drawer with working drawer.
9. reconnect both 'L shape' restraints.
10. reconnect air hose to drawer.
11. replace sensor and drive connectors [note numbers on cables and socket size]
12. turn air tap back on, and check for leaks.
13. wait for pressure to stabilise at 5bar [electrical system should automatically switch on at 5bar]
14. close and lock glass doors.

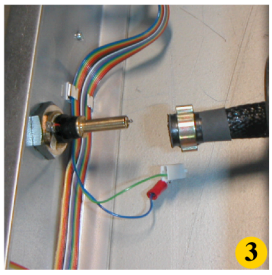
replacing pneumatic-muscles

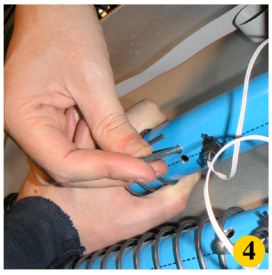
1. disconnect wires from muscle. (picture 4 - parts 2&3)
2. remove black rubber stop.
3. remove cotter pin [split pin]. (picture 4 - part 4)
4. unscrew muscle [or valve] being careful not to damage the wiring. (picture 4 - parts 5&6)
5. pull muscle out from blue tube. (picture 4 - part 7)
6. place piece of tape around the muscle to identify it as broken.
7. place 'o' ring over the screw valve. (picture 4 - part 8)
8. screw muscle to manifold, being careful not to damage the red wire on the thread. (picture 4 - part 9&10)
9. identify correct mounting hole by checking orientation of tap. (picture 4 - parts11&12)
10. insert replacement muscle, being careful not to hit the tap on any surface. (picture 4 - part 13)
11. pull back spring, and line up mounting pins with correct hole. (picture 4 - part 14)
12. insert cotter pin [split pin] through hole and mounting pins. (picture 4 - part 15)
13. check muscle is fixed by both mounting pins [if not, repeat from step 8] (picture 4 - part 16)
14. insert lug into the eye of the cotter pin. (picture 4 - part 17)
15. reconnect wires to the muscle. (picture 4 - part 18)
16. place new rubber stop by the valve. (picture 4 - part 19&20)
17. check tube impacts only on the rubber stop. (picture 4 - part 21)

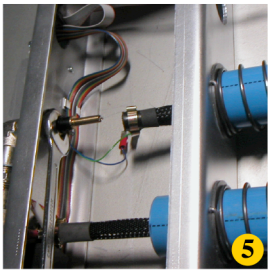
in images

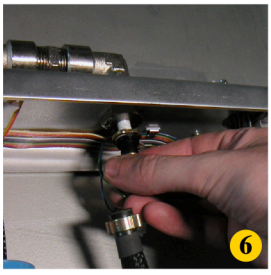


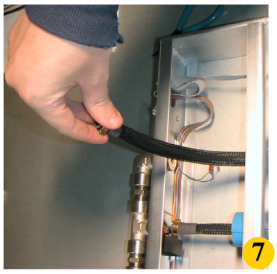


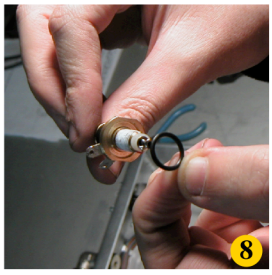


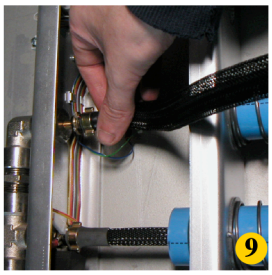


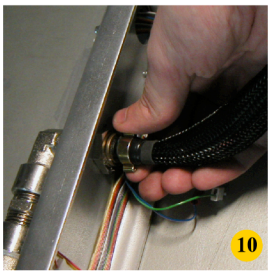


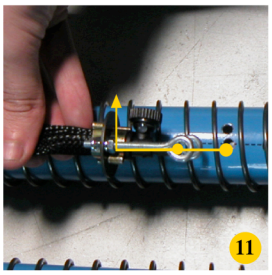


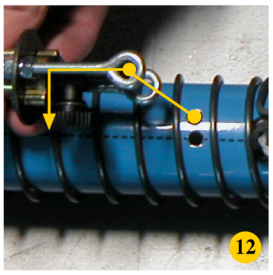


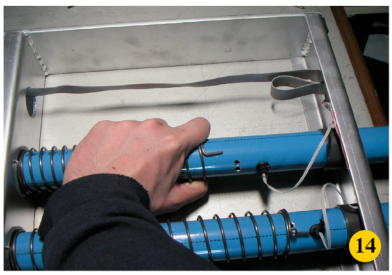


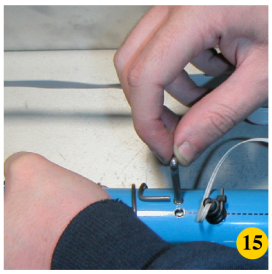


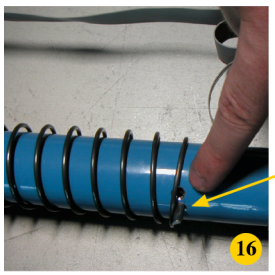


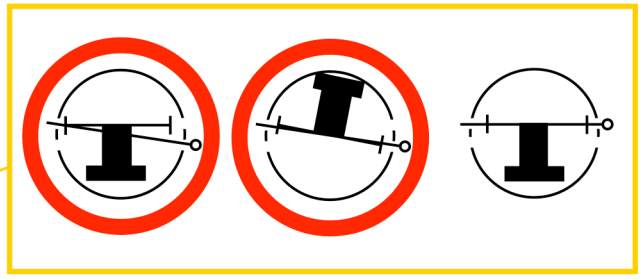


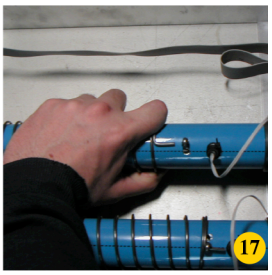


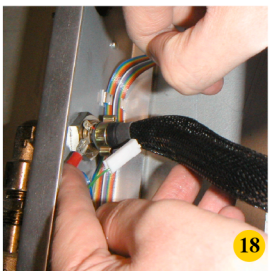


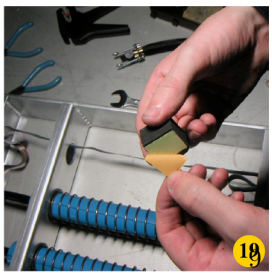


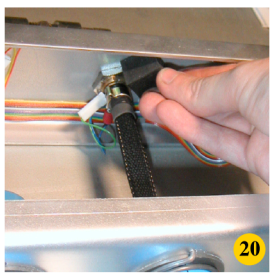


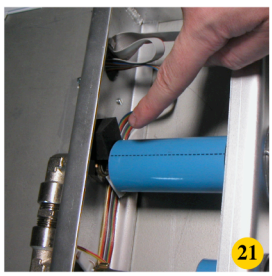












picture 4

calibration of a repaired drawer

calibration must be performed after a muscle or drawer has been replaced. Running the exhibit with uncalibrated muscles will damage and possibly break the replaced parts. The calibration takes several steps, and must be followed exactly. There are 2 cycles required for calibration, and in total 3-5 minutes is required for each row to be completed. Note that the calibration board has 2 sides, a 'long' side and 'short' side.

1. remove the membrane [see section 'changing membrane']
2. put the units into 'short calibration mode' by pressing '2' on the keypad (picture 3 - part 4)
3. press the 'short' side of the calibration board into the row requiring calibration.
4. the muscles will slowly retract, and do not need to be forced back.
5. once the board has reached the frame, hold the board in place and keep it still
6. when the board is pushed outwards, the calibration cycle has finished.
7. press '8' on the keypad to see if muscles retract correctly.
8. put the units into 'long calibration mode' by pressing '3' on the keypad.
9. repeat steps 3-6 using the 'long' side of the calibration board.
10. press '9' on the keypad to see if muscles retract correctly.
11. press 'enter' on the keypad to resume normal operation.

repair and return of damaged components

Any damaged components from the drawers should be sent back to foam [see contact details]

operation modes

The number pad mounted on the computer inside unit #1 (picture 3 - part 4) can be used to change the operating modes of both the units. The following commands are available;

- 7 : wave animation (calibrated)
- 8 : test calibration position 1 (short)
- 9 : test calibration position 2 (long)
- - : row/column animation (calibrated)
- * : row/column animation (uncalibrated)
- 1 : all muscles to 0 (sticking out)
- 2 : calibration mode position 1 (short)
- 3 : calibration mode position 2 (long)
- E: normal operation mode

parts list

air

The main pneumatic components are not serviceable, and must be replaced if a failure occurs.

- Compressed Air Filter AF0056-AF0706 [installed sept.2005]
- Regulator 2R101G
- Airpress tank
- pressure switch

drawers and rods

All components are custom built, or modified and need to replaced as outlined in this manual. Foam will supply spare parts as required.

power

- line voltage is standard 220V 60hz.
- Fusebox 'Junior' IP44/IP54

electronics/data

- computer is an apple 'mac mini' with custom software and needs to be replaced by foam.
- muscle control boards are custom built, and need to be replaced by foam.
- Linksys 8 port switch SD208
- 1m cat5 ethernet cables

paint

- Use 'MONTANA' brand spray paint, with the following colours;
- frame and washers on glass - 'Anthracite Grey' R7016
- drawers - 'Silver' CROM

adhesives

- foam caps - 3M Scotch-Weld Structural Plastic adhesive DP-8005
- Bushings internal - Araldite 2011 epoxy adhesive.
- Bushings external - Loctite all plastics, all materials adhesive

nuts/bolts/screws/etc+

- internal - m4 m6 or m8
- front - hex m6
- glass - m12

contact details

foam

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for return and replacement parts, send the broken things with DHL (or similar)

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