VOZ ALTA

By Rafael Lozano-Hemmer

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General important information

VOZ ALTA, (2008),
By Rafael Lozano-Hemmer

Description

"Voz Alta" (Loud Voice) is a memorial commissioned for the 40th anniversary of the student massacre in Tlatelolco, which took place on October 2nd 1968. In the piece, participants speak freely into a megaphone placed on the "Plaza de las Tres Culturas", right where the massacre took place. As the megaphone amplifies the voice, a 10kW searchlight automatically "beams" the voice as a sequence of flashes: if the voice is silent the light is off and as it gets louder so does the light's brightness. As the searchlight beam hits the top of the building of the Ministry of Foreign Affairs, now Centro Cultural Tlatelolco, it is relayed by three additional searchlights, one pointed to the north, one to the southeast towards Zócalo Square and one to the southwest towards the Monument to the Revolution. Depending on the weather, the searchlights could be seen from a 15Km radius, quietly transmitting the voice of the participants over Mexico City. Anyone around the city could tune into 96.1FM Radio UNAM to listen in live to what the lights were saying.

When no one was participating, the light on the Plaza was off but the three lights on the building played back archival recordings of survivors, interviews with intellectuals and politicians, music from 1968 and radio art pieces commissioned by Radio UNAM. In this way the memory of the event was mixed with live participation.

Thousands of people participated in this project, without censorship or moderation. Participation included statements from survivors, street poetry, shout-outs, ad hoc art performaces, marriage proposals, calls for protest and more.

Operation

1. Connect the piece to electrical power via an extension cable. Voz Alta comes with a 3 prong power plug (NEMA 5–15) (see image #1). The power plug is located at the bottom of the metal base. You will need to use an adapter to connect this plug to a non-North American extension cable.

You may connect the piece to 100-120V 60Hz (American) or to 210-240V 50Hz (European)


#1

current, as all the gear inside has auto switching power supplies.

2. To turn the piece ON, firmly press the large red button located at the bottom of the piece (see image #2). Once the button is pushed, it takes up to 3 minutes for the piece to start-up. Now press the button on the side of the microphone and start speaking.
Important note: Only push the power button once to start the piece.

3. To turn the piece OFF, press the power button once. Only do so when the search light is not illuminated.
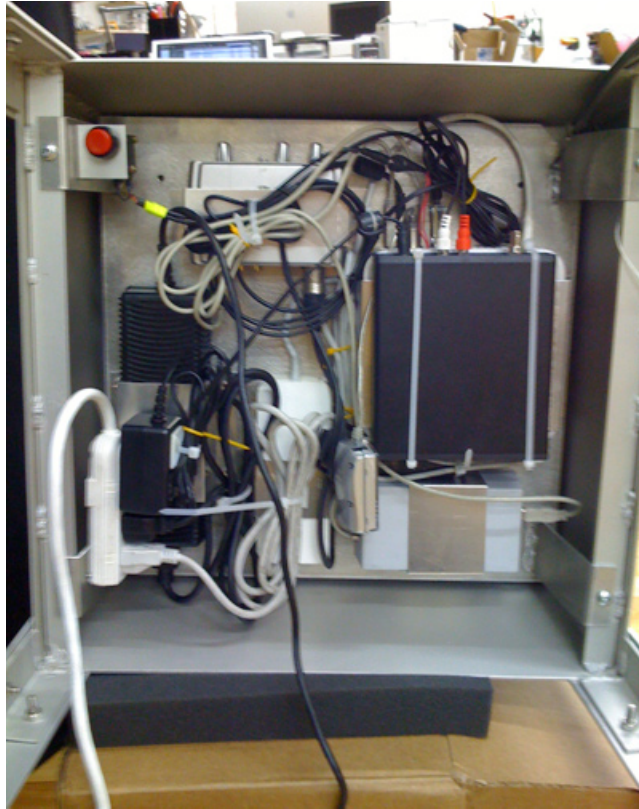

#2

Cleaning

The aluminium frame is anodized which makes the frame resistant to fingerprints. Only a damp cloth should be used for cleaning. Do not use soap or any other cleaning products. Only use a soft rag— nothing abrasive. The same is true for the glass window on the search light. Make sure it is completely dry before turning the piece on again.

Placement and Setup Instructions

Place the Voz Alta so the search light's beam can shine far into a room. The beam should be a length of 6-15 meters. At the end of the light beam, a small non-descript FM radio is placed directly in the middle. (see image #3)
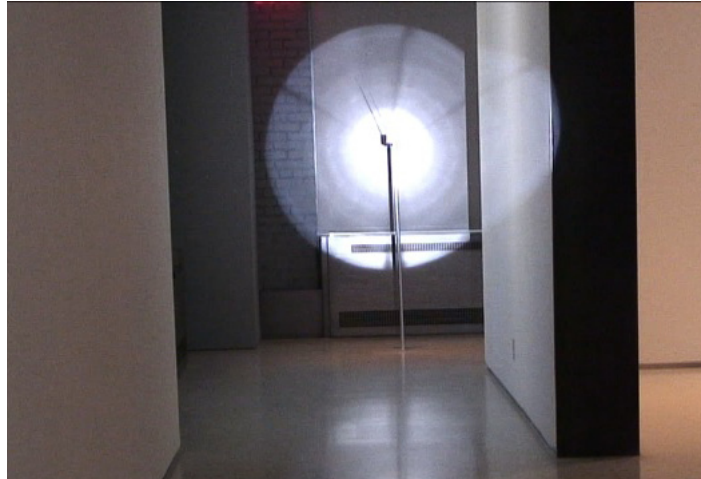

#3

We supply such a small FM radio but any non-descript FM radio can be used.

Make sure the megaphone, light fixture, light beam and small FM radio are all in line with one another.

There are three options to fine-adjust the pointing of the light:

1. Each of the four legs are attached to a metal foot. The bolt connecting the two pieces can be loosened slightly. Since the hole for the bolt is a bit larger than the bolt itself, small height adjustments can be made.
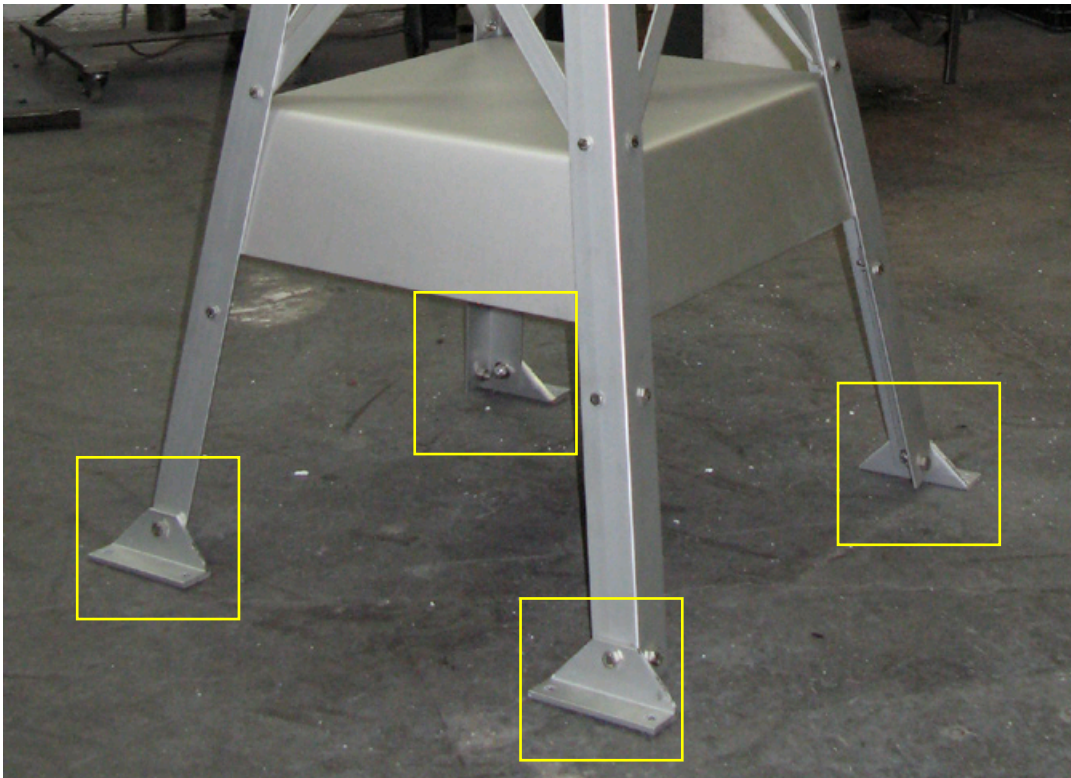
#4

2. Open the back of the megaphone by removing two screws marked in image #5. Lift the top off by pulling on the handle. Inside you will see the black metal body of the maxa beam light fixture. By turning the screw marked in image #6 the light's vertical positioning can be adjusted.
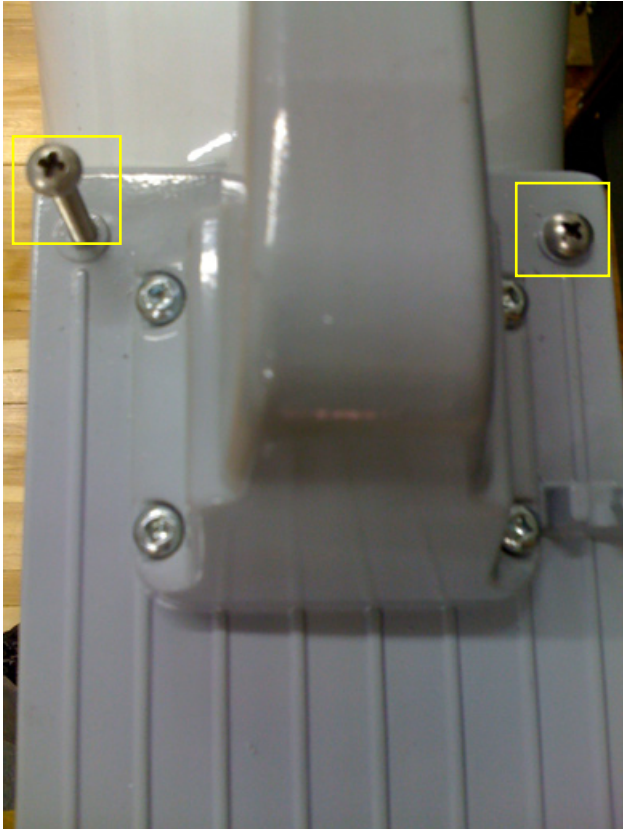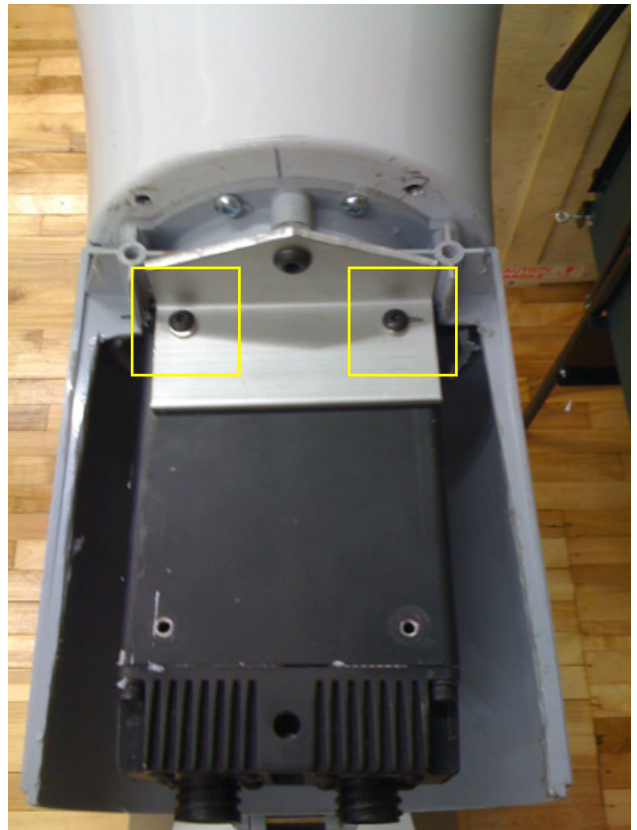

#5

#6

3. To adjust the horizontal pointing direction of the light, one can slightly loosen the two screws marked in image #7 and shift the light fixture in the desired direction.

To improve the radio reception you can adjust the length of the antenna. The antenna is the coiled wire hanging from the middle of the aluminium stand. This is an aesthetic choice.

#7

Software

The piece includes custom-made software that automatically starts up and self-calibrates.

Replacing the Xenon light bulb

Please consult Appendix 1 to find the manufacturer's manual on how to replace the light bulb. You do not need to take the light fixture out of the megaphone housing. The light can be accessed through the front of the mega phone housing.

Replacing the MaxaBeam light fixture

If the MaxaBeam light fixture ever needs to be completely replaced, then you have to open the megaphone housing. Consult images # 5-7 and the accompanying text to open and remove all the necessary screws.

Detach the two black plastic screw connectors marked in image #8. Now the light fixture can be pushed out toward the front of the megaphone.
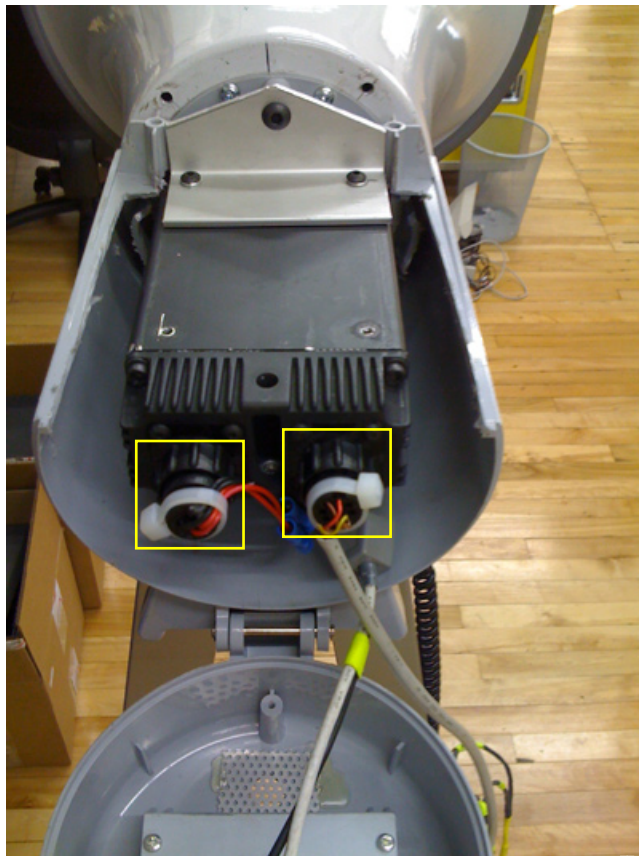
#8

Detailed technical information

Components of the piece

Aluminium Stand

The stand is made of anodized aluminium and houses all the electronic equipment inside the large aluminium box.

Xenon Search Light

A MaxaBeam Searchlight (MBS-430-RSY 75W Xenon) is mounted inside the mega phone.

Modified Megaphone

The modified megaphone consists of the megaphone's housing and a hand-held microphone.

Computer

An Apple MacMini computer is mounted underneath the aluminium box inside the aluminium stand. The MacMini has 2 Gigabytes of RAM, at least a 1.6 GHz dual core Intel processor, at least 128MB of VRAM with a DVI graphics link. The computer is equipped with sold-state hard drive with the operating system MacOSX 10.5 Leopard installed on it. The computer also comes with a one-year warranty and can be easily removed for future replacement.

Radio Transmitter

A Ramsey FM35 Stereo FM radio transmitter is used to broadcast the audio from the megaphone to the radios in the gallery.

USB to Serial Adapter

A High-Speed USB Serial Adapter Keyspan by Tripp Lite (Model #: USA-19HS) is used to establish communication between the computer and the search light.

USB Audio Interface

The megaphone's microphone is connected to an M-Audio fasttrack USB audio interface which relays the audio to the connected computer. The sensitivity of the microphone can be adjusted through this component.

Custom-made Electronics

A grey plastic box is mounted underneath the aluminium box located inside the aluminium frame. The plastic box contains custom electronics which interface the microphone, the microphone button and the search light.

Software

The project software is programmed entirely in objective-c and the source code is open to the collector for future compilation to accommodate forthcoming operating systems or hardware. Gideon May, the engineer who programmed the software can be contacted through Lozano-Hemmer studio:

Antimodular Inc.
4060 Blvd. St-Laurent, studio 107
Montréal Québec H2W 1Y9 Canada
Tel. 1-514-597-0917
Fax 1-514-597-2092
www.lozano-hemmer.com

 A full set of CD-ROMs with software is included.

Troubleshooting

The piece comes with one Ethernet port on the computer that can be used to network the computer without needing to attach a screen and mouse. Likewise, a USB port allows hooking up a mouse and a keyboard. The USB port or USB hub can also be used for updating software that may be shipped in a USB memory drive. Many of the manipulations described below imply that a mouse has been plugged in the USB port of Voz Alta. We suggest that you use the mouse provided with the piece, but any 2-button USB mouse equipped with a scroll wheel will work.

Voz Alta is not turning on

If you press the power button for the piece while it is plugged to the mains and no changes are apparent, the first step is to wait up to 4 minutes between each firm button press, as it may take some time for the piece to boot up. If after a couple of tries there is still nothing on the screen, try the following steps:

Check the power outlet that the piece is connected to.

Verify that the power outlet Voz Alta is plugged into is working properly. Unplug Voz Alta from the outlet and plug in another electrical device that will allow you to confirm that it is functioning. When this is done, remove the device and plug the Voz Alta back in firmly. Finally, ensure that this same power cable is connected properly on the bottom of Voz Alta.

It's possible that an internal cable has come loose during shipping.

Consult appendix 5 - wiring diagram - to assure all cables are still connected and connected properly.

Support

If you would like support for the piece please feel free to call Lozano-Hemmer's studio in Canada:

Antimodular Research
4060 St-Laurent, studio 107
Montréal Québec H2W 1Y9 Canada
Tel 1-514-597-0917 Fax 1-514-597-2092
info@antimodular.com
www.antimodular.com

Appendix 1 – Maxa Beam Xenon Search Light

Item # MBS-430-RSY 75W Xenon Wired Remote Searchlight - RS232, Spyder Front Lens

larger image

The MBS-430 Series Searchlight is the mounted, remote-controlled Maxa Beam model. Searchlight features include:

- Output: 7,500,000 CandlePower
- Reinforced "Spyder" Lamp Support for Rugged Applications
- Standard Plastic Power Connector and Remote Connector

- Control Style: RS232 Computer Interface
- Lamp: 75W Xenon short arc; field replaceable & rated at 1000 hours
- Effective Visible Range: 3000m
- Effective Infrared Range with 850nm Filter (sold separately): 1200m
- Motorized Zoom: 1° Spot to 40° Flood
- User-Programmable Strobe Function

The New Maxa Beam Graphical User Interface (GUI) is available for use with this RS232-enabled searchlight system.

Specifications	Included with this Product	Strobe Lights as Non-Lethal Weapons
Output (Candlepower)	7,500,000	
Lamp Rating (hrs.)	1000	
Strobe Function	Rate: 1–31Hz Duty Cycle: 3–63% (Controlled by Operator via Computer)	
Searchlight Power Source	12VDC	
Control Type	Remote Handle	
Environmental Rating	IP66	
Weight (lbs.)	3.2	

http://peakbeam.thomasnet.com/item/all-categories/n-wired-remote-searchlight-rs232-spyder-front-lens/mbs-430-rsy?&plpver=10&assetid=

MAXA BEAM SEARCHLIGHT MAINTENANCE KIT

MBA-2400-Y:
LAMP REPLACEMENT KIT FOR "SPYDER" LENS LIGHTS

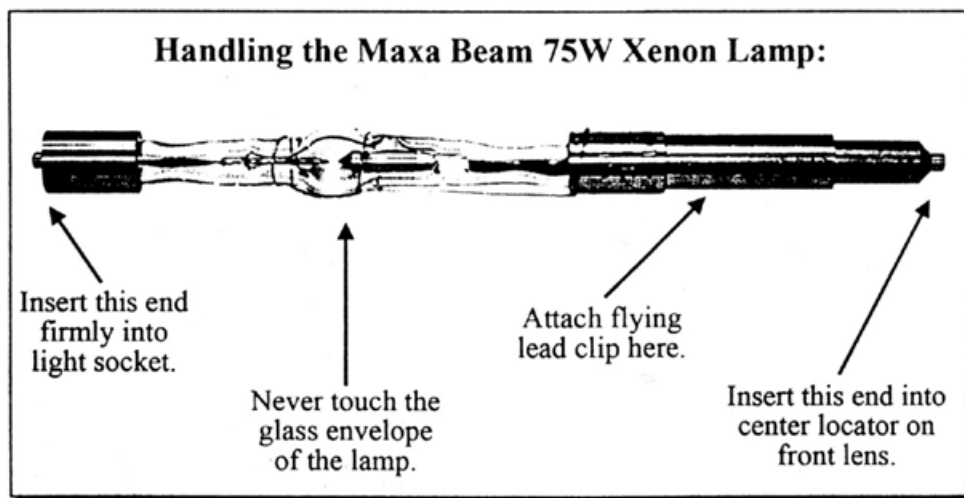### CONTENTS:

(1) Plastic Box
(1) 300-03-001 Lamp Container
(1) 300-03-004 Safety Goggles
(1) Cleaning Tissue
(1) TL-002 Hex-Driver
(3) H-108 Screws 4-40 x 3/8"

(1) O-Ring
(1) L75-001 Lamp
(1) 100-04-017 Front Lamp Support
(1) 100-04-012 Rear Lamp Support
(1) 100-04-022 Lamp Support Spring
(1) Instruction Sheet

SAFETY PRECAUTIONS:

- ALWAYS wear eye protection any time the front glass is removed from the searchlight or when handling the xenon lamp.
- ALWAYS disconnect the power cord from the searchlight when performing maintenance or when storing or transporting.
- NEVER touch the glass envelope of the xenon lamp. If accidentally touched, clean with glass cleaning solution or alcohol.
- NEVER clean the reflector with any abrasive. Clean with ordinary glass cleaning solution or alcohol.
- NEVER look directly into the searchlight when it is turned on. Due to the high intensity light that is emitted, serious eye injury may occur.

LAMP REPLACEMENT INSTRUCTIONS:
READ ALL INSTRUCTIONS BEFORE BEGINNING.

Handling the Maxa Beam 75W Xenon Lamp:

Insert this end firmly into light socket.

Never touch the glass envelope of the lamp.

Attach flying lead clip here.

Insert this end into center locator on front lens.

1. Disconnect power cord from searchlight and wear included protective eyewear.

2. Open the searchlight to gain access to the lamp:

   a. *Standard Maxa Beam Searchlight:* Remove three screws holding front lens in place with included driver. Remove front lens and O-ring.

b. *Maxa Beam Searchlight in Watertight Enclosure:* Remove the six screws on the BACK of the tube. Pull firmly on the rear handle; searchlight will slide out of the tube. Remove the three screws holding the front lens in place and remove the lens.

3. Unclip the electrical connection from the front of the lamp.

4. Remove the lamp from the socket by grasping the metal end and pulling straight out with a slight twisting motion. Do not put any side pressure on the lamp. If the lamp is broken, remove the base of the lamp from the socket using a pair of needle nose pliers. Remove broken glass from the inside of the searchlight by holding the reflector towards the front and gently shaking the searchlight until all fragments are removed.

5. If desired, clean the reflector. To avoid scratching the surface of the reflector, remove all abrasive substances. Gently blow away any glass fragments or other particles from inside of the reflector (compressed air in a spray can may be used) before cleaning with the provided cleaning wipe.

6. Remove the new xenon lamp from protective tube. DO NOT TOUCH THE GLASS ENVELOPE OF THE LAMP. Hold the longer "shock absorbing" metal end of the lamp.

7. Push the lamp firmly and squarely into its socket with a slight twisting motion. It must be all of the way into the socket in order for the electronic focus to operate properly.

8. Connect the electrical clip to the new lamp (see diagram for location).

9. Locate the O-ring and Spyder Front Lens. Place the O-ring over the step on the inside of the front lens assembly.

10. Firmly place the front lens and O-Ring on the front of the light. Ensure that the end of the lamp seats in the center of the Spyder lens. Once the front lens, O-ring and lamp are positioned correctly, secure the assembly in place with the three new H-108 screws in the kit. Do not over tighten screws. When properly installed, the O-ring should not be visible.

11. After replacing the front cover, the searchlight may need to be refocused. To refocus the lamp, use the hex driver to remove the two focus access screws (one on right front side and one just left of the front of the handle). Shine the light beam onto a flat surface about 50 feet away. Insert the hex driver into one of the focus access holes and turn the driver to center the hotspot of the beam. Repeat this procedure for the other adjustment screw. Replace the focus screws and washers when focusing is complete.

12. *Watertight Enclosure Lights Only:* Since the light is in a watertight tube there is no O-Ring seal on the searchlight itself. To reseal the light in the enclosure, first ensure that the large O-Ring is in place on the back plate of the enclosure. Slide the searchlight back into the enclosure and seal tube using the 6 original screws and washers.

CONTACT THE FACTORY:

Please contact the factory if you need help performing maintenance on your Maxa Beam searchlight. We are happy to assist you over the phone or via E-mail: *(610) 353-8505 / techsupport@peakbeam.com.*

Appendix 2 – Radio Transmitter

FM30 SETUP:

FM30 operation is about as simple as it gets. The [SETUP] button cycles through the various screens, and the [UP]/[DOWN] button adjusts the value on the particular screen.

Connect the included power supply. Also connect your whip antenna. You shouldn't operate the FM30 without some kind of antenna; a transmitter should always transmit into a load of some kind and not into an open, even if it is operating at a relatively low power output.

Turn the kit on. You should hear a beep and see "FM-30, Rev 1.2" on the display, then in a few seconds the screen will change to a default display. The default display shows the current set power, frequency, clipping detector status, and the VCO voltage while still attempting to lock. Readjust your contrast now if you need to.

Pressing the [SETUP] button once brings us to the frequency display. Here, using the UP/DOWN buttons, we can select our frequency of operation. Note the voltage display which indicates the current VCO voltage. This helps us diagnose any problems if something goes wrong. If the voltage stays low (<0.5V) or high (>9.9V) no matter what frequency we choose, then the FM30 may not be locked.

Set your desired test frequency now. You should choose an open or "dead" spot on the FM dial as a starting point if you're not yet sure what frequency you can transmit on without interfering with anyone. Check the FCC information section of this manual for more details on legal part 15 broadcasting. Use the UP/DOWN buttons to select your frequency.

Pressing the SETUP again gets us to the mode display. Here you can toggle Stereo and Mono modes.

FM30• 26

Another press of the SETUP button brings us to the volume display. Connect your line level source to the FM30. Your source can be a CD player line out, a computer sound card line output, or any other audio source you desire as long as it is line level. Anything other than line level audio will sound distorted and cost you time troubleshooting a non-existent problem. NEVER connect the FM30 audio inputs to speaker outputs of a high power stereo system; such a connection will destroy the IC chip. Trust us when we say that a true line level audio source will give you the best results with your FM30.

The default volume setting is roughly ½ of full, which is a gain of 1. The means that 500mV peak audio coming into the FM30 is 100% modulation, typically, depending on frequency. The volume display also includes the clipping detector status and you should adjust the volume until the indicator toggles from '-' to 'g' occasionally, roughly a 50/50 timing between the two, with an occasional 'c' mixed in. If the character is always at '-', the modulation is too low, and if 'C' ever shows up (capitol) it means you are over modulating. It's best to set your level up or down until you see the lower case 'c', which means that you're on the edge of clipping. If you see the lowercase 'c' it means that you're distorting a bit so if you want to avoid that completely, make sure you set the level so that you only see the 'g'. Of course you can simply adjust the volume until it sounds right to you.

The order of characters is approximately on average:
'-' <= +/-60kHz
'g' >+/-60kHz and <+/-75kHz
'c' >+/-75kHz and <+/-90kHz
'C' >+/-90kHz

Remember from the circuit description that the indicator doesn't specify the exact level, but the frequency with which the audio signal surpasses approximately 60kHz of deviation. The indicator is based on music signals, not test tones.

Again pressing the setup button will get us to the balance setting. The balance simply attenuates one side or the other depending on the adjustment. Set in the center there is no attenuation. Use the [UP]/[DOWN] buttons to swing the balance to the left or the right. The best way to adjust this is to listen on a receiver with headphones, and then adjust the balance until lead vocals sound like they are in the center of your eyeballs.

The last setup display is the power setting. This is a relative display simply showing you the drive through the level adjustment pin diode. However the power adjustment is not incremental like the display. For example, ½ of the bar is not necessarily ½ of the power. If you want exact power settings you'll need to use a piece of test equipment such as our sensitive PM50 to adjust it,

but that is not strictly necessary. The best thing to do is to set up your unit and antenna as you intend to use it normally. Then, using a portable radio, go to the furthest distance you intend to receive the transmission from the FM30 (front living room, garage, deck, etc.) and have someone else turn up the power until you receive the signal clearly. Stop adjustment right at this point; this is as far as you will need to go! You may be surprised by how little power you really need. If you have to run it at full power you may need to play with the antenna a bit because that may indicate that you don't have a good match.

The last setup screen allows you to save all of your changes. Pressing the [UP] button will save them to the internal FLASH memory; [DOWN] will continue to use the current settings, but will not save them to FLASH in case you need to make some more changes. Cycling through all of the displays again will get you back to this screen to save all of your changes.

The red or green tunable capacitor, C56, is there if you wish to adjust the frequency of your FM30. It is really only for experienced folks with test equipment. The units power up very close to "right on" and no adjustment is needed, however, for those of you who like perfection and have a frequency counter with good resolution or other test equipment to tell you *exactly* what frequency you're transmitting, feel free to adjust the frequency with this cap. The swing is approximately 4kHz total. If you don't have access to test equipment, please don't adjust this cap, and trust us when we say that you don't need to.

Appendix 3 – Mega Phone

http://www.toaelectronics.com/megaphones.asp
Model # ER-2230W

TOA MEGAPHONE (WITH WHISTLE SIGNAL)   ER-2230W

■DESCRIPTION

The ER-2230W is a shoulder megaphone having facilities of EXT. mic input, an AUX input,
a DC power input, a battery meter whistle sound.
It can be mounted to the optional ST-16 speaker stand.
Its microphone assembly are given germ-resistant treatment.
The newly developed polyimide diaphragm is employed to ensure high sound quality.

■SPECIFICATIONS

(*1) 0 dB = 1 V

Power Source	Battery: R20P (D) × 10 (15 V DC) External Power: 12 V DC Battery
Rated Output	30 W
Maximum Output	45 W
Signal Sound	Whistle (1,600 to 2,400 Hz)
Battery Life	Voice: Approx. 17 hours (JEITA (*2)), Whistle: Approx. 90 min. (JEITA (*2))
Audible Range	Voice: Approx. 800 m (JEITA (*2)), Whistle: Approx. 1000 m (JEITA (*2))
AUX Input Sensitivity	−10 dB (*1) (300 mV), 10 kΩ (ø3.5 mini jack, stereo plug acceptable) , volume control
EXT. Mic Input	600 Ω, unbalanced, ø6.3 phone jack, volume control
Diaphragm	Polyimide film (voice coil, bobbin)
Anti-bacteria Treatment	Microphone
Remaining Battery Indication	LED (also serves as a power indicator) Steady ON: Normal use, Flashing: Batteries need replacement
Operating Temperature	−10℃ to +40℃
Finish	Horn ring: Vinyl chloride, gray Horn: Aluminum, light gray, paint Case top: Die-cast aluminum, gray, paint Strap: Nylon, black, Others: ABS resin, gray
Dimensions	ø 351 × 512 mm
Weight	3.6 kg (without batteries) , Microphone: 150 g
Accessories	ø3.5 mini plug (AUX input)··· 1, External power supply cord (1 m)··· 1, Splash-proof cover··· 1 (*3)
Option	Speaker stand: ST-16, Microphone: DM series

(*2) JEITA: Japan electronics and information technology industries association. (EIAJ TT-4501A)
(*3) Do not use the unit in heavy rains or strong winds, or in locations where the unit is directly
    exposed to water even using with the supplied splash-proof cover.

Note: Batteries are optional.

■APPEARANCE

<Note on the audible range and battery life>
  1. The indications of the audible range and battery life are based on
     the JEITA Standard (*2).
  2. Audible Range presumes that the megaphone employs new batteries
     and is used on a quiet street.
     It varies depending on such conditions as battery consumption,
     ambient noise, wind direction and obstacles.
  3. Battery Life assumes that megaphone is used for 30 minutes a day.

512
1000mm in length
136.5
68
95
52
100
ø351
400mm
(1800mm in length)
ST-16 (*4)
(option)
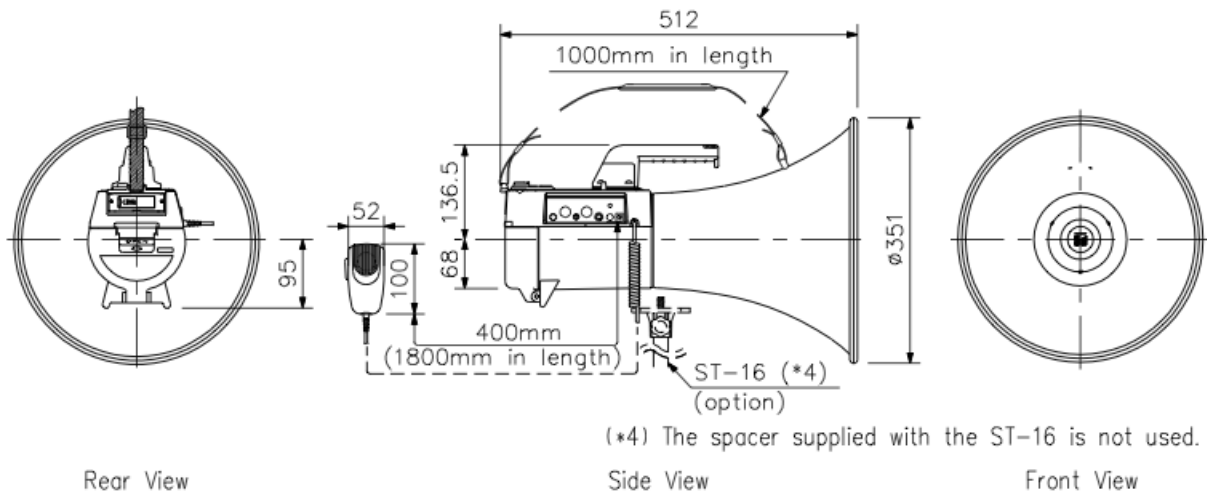
(*4) The spacer supplied with the ST-16 is not used.

Rear View   Side View   Front View

UNIT: mm   SCALE: 1/10

TOA Corporation

DWG No: GER01FA1-3

Appendix 4 – USB Audio Interface

System Requirements

Windows

Minimum:

- Pentium II 350 MHz
- 64 MB RAM
- Windows XP
- CD-ROM drive
- Available USB 1.1 port

Recommended:

- Pentium III 500 MHz or faster
- 128 MB RAM or more
- Available USB 1.1 port
- Windows XP

Macintosh

Minimum:

- G3, G4, iMac, iBook or PowerBook with native USB support
- 64 MB RAM
- CD-ROM drive
- Mac OS X version 10.2.8 "Jaguar" or later, or Mac OS X version 10.3.4 "Panther" or later

Recommended:

- G3, G4, iMac, iBook or Powerbook with native USB support (USB hubs are not supported)
- 128 MB RAM
- Mac OS X "Jaguar" version 10.2.8 or later

M-Audio suggests you also check the minimum system requirements for your software, as they may be greater than the above.


Front Panel Controls
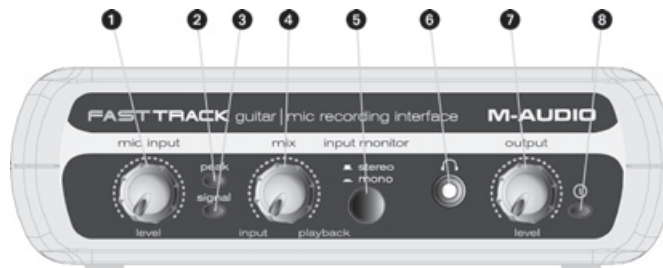
1. **Input Level** – Adjusts the gain level for the rear-panel XLR input (14).
2. **Peak LED** – Indicates presence of peak input level from XLR input. Lights when input signal approaches –3dB before overload.
3. **Signal LED** – Indicates presence of input signal from XLR input. Lights when input signal level approaches –40dB.
4. **Input/Playback Mix Control** – Controls the ratio of input signal to playback signal from your DAW. (When you record, you should mute the track you're recording. Otherwise, you'll hear the analog input signal AND latency delayed recorded signal.)
5. **Mono Switch** – When pressed, this switch sums the input signals to mono for direct monitoring.

6. **Headphone Output** – Standard 1/8" stereo headphone output.
7. **Output Level** – Adjusts overall output volume level. This control affects both the rear panel RCA outputs (11) and the headphone output (6).
8. **Power LED** – Lights when the unit is powered on.

Rear Panel Controls
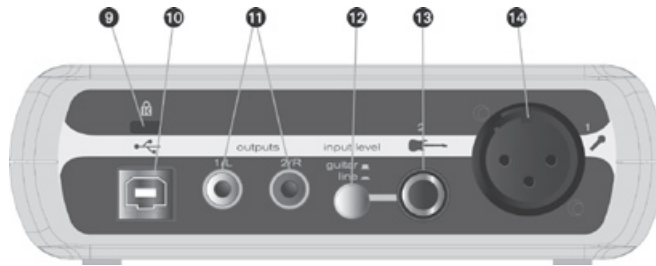
9. **Kensington Lock Connector** – Connect a standard laptop-style cable locking device here to protect your Fast Track USB from theft or accidental breakage.
10. **USB Connector** – Connect the included USB cable here, and connect the other end to your computer's USB port.
11. **Line Outputs** – Left and Right stereo outputs. Connect these outputs to powered monitors such as the M-Audio DX4s, or to the inputs of your stereo amplifier or receiver.
12. **Input Level Switch** – Input level selector for the 1/4" TRS input (13). When connecting a balanced line level input here, the switch should be set to LINE position. When connecting an instrument, the switch should be set to the GUITAR position.
13. **Guitar Input** – TRS 1/4" input for line/instrument level input. The input level is determined by the Line/Instrument Switch (12).
14. **Mic Input** – Balanced XLR input for connecting a dynamic microphone.

Software Installation

Your Fast Track USB is class compliant in Mac OS X (10.3.4 or later), offering true plug-and-play operation. Just plug it in, and you're ready to start recording.

Your Fast Track USB also comes with M-Audio's exclusive low-latency driver software for Windows XP that allows for faster communication with your computer operating system.

Your Fast Track USB comes with a standard USB cable. The squared end of the cable connects to the Fast Track USB; the flat end connects to your computer's USB port.

Specifications

mic in (balanced):		5line out (unbalanced):	
maximum input:	-2.2dBu	maximum output:	+2.0dBV
signal-to-noise ratio:	100dB (a-weighted)	signal-to-noise ratio:	104dB (a-weighted)
dynamic range:	100dB (a-weighted)	dynamic range:	104dB (a-weighted)
THD+N:	0.005% (-86dB) @ -1dBFS	THD+N:	0.004% (-88dB) @ -1dBFS
variable gain:	50dB	frequency response:	20Hz - 20kHz, +/- 0.2dB @ 48kHz
frequency response:	20Hz - 20kHz, +/-0.2dB @ 48kHz	**headphones (32 Ohm load):**	
instrument in (unbalanced):		maximum output:	2.1Vpp (-2.5dBV)
maximum input:	+3.2dBV	signal-to-noise ratio:	103dB (a-weighted)
signal-to-noise ratio:	96dB (a-weighted)	THD+N:	0.075% @ -2dBFS
dynamic range:	96dB (a-weighted)	**sampling rates (k):**	44.1kHz, 48kHz
THD+N:	0.005% (-86dB) @ -1dBFS		
frequency response:	20Hz - 20kHz, +/- 0.2dB @ 48kHz		
line in (balanced):			
maximum input:	+2.1dBV		
signal-to-noise ratio:	98dB (a-weighted)		

Appendix 5 – Wiring diagram

USB
Audio
Button circuit
Antenna
Power

Power Button

Audio Interface

Mac Mini

Searchlight Power Supply

Transmitter Power Supply

Radio Transmitter

Power Bar

Computer Power Supply

USB-Serial

Custom Electronics
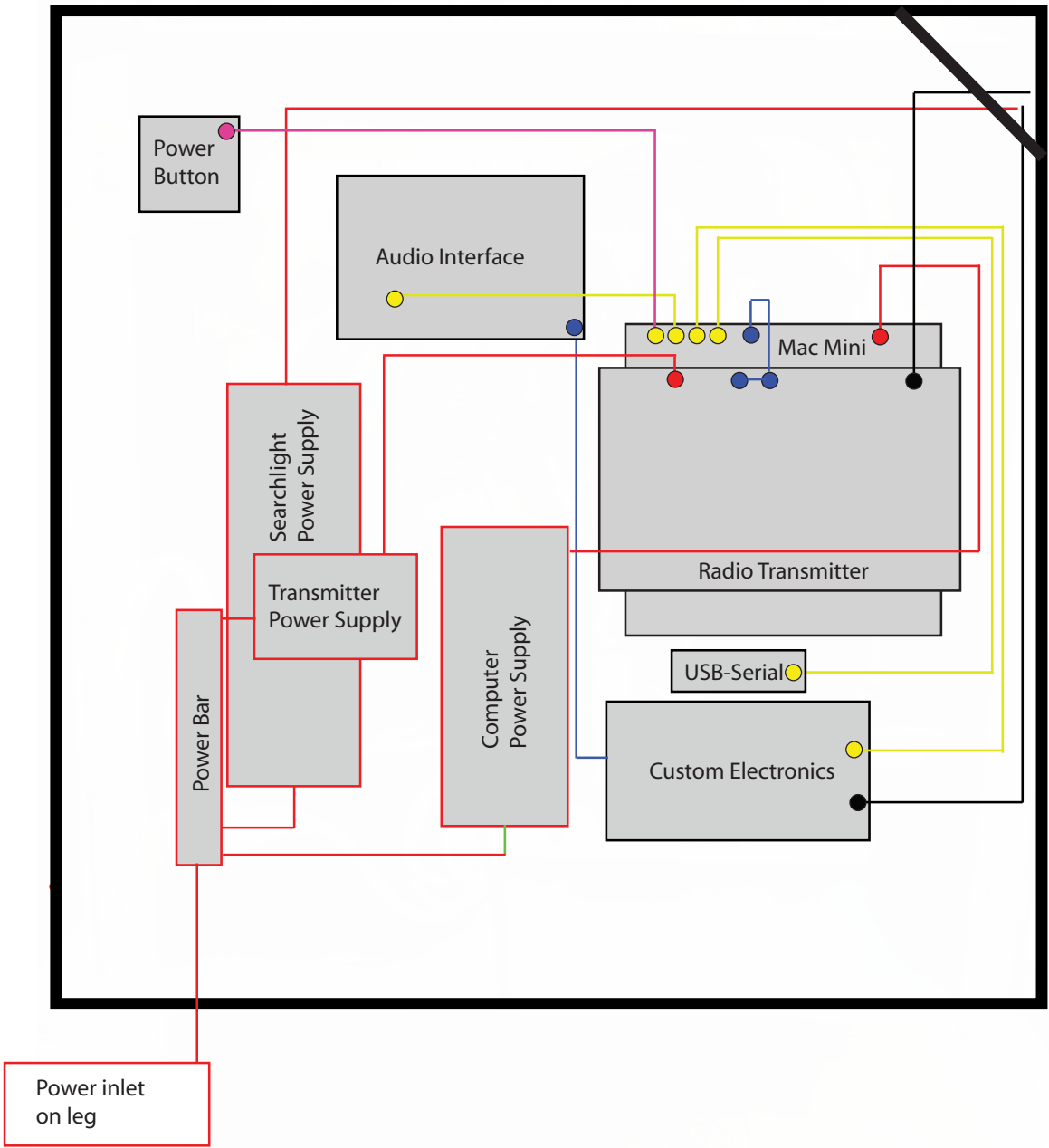
Power inlet on leg

view from underneath

Power Button

Audio Interface

Mac Mini

Radio Transmitter

Searchlight Power Supply

Computer Power Supply

Transmitter Power Supply

USB-Serial

Power Bar

Custom Electronics

Power inlet on leg