BrainWave Option
Hardware Installation

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10/22/01

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
A	8 16 01	Bullwinkel	initial release
B	9 4 01	Bullwinkel	
C	9 28 01	Bullwinkel	
D	10-11-01	LaBarge	Added GE PN for manual, cleaned layout and styles, added Trigger pictures and text.
E	10-18-01	LaBarge	Updated shipping list.
0	10-22-01	Kopp	release

TABLE OF CONTENTS

1- INSTALLATION OVERVIEW

The GE BrainWave Option consists of software and hardware to present fMRI patient stimuli synchronized with MR scanning. This document describes the hardware installation for this option. The hardware consists of the BrainWave Cart located in the magnet room, the BrainWave Cabinet located in the equipment room, and the Audio Console located in the control room.

Cable runs must be made from the magnet to the Penetration Panel, from the Penetration Panel to the BrainWave Cabinet, from the Systems Cabinet to the BrainWave Cabinet, and from the BrainWave Cabinet to the Control Room.

1-1 Options Installed by This Manual

This manual describes installation of the following GEMS MR catalog options:

- M1033BM — BrainWave Option

1-2 Shipping List

The BrainWave hardware is shipped as a partially assembled cabinet (BrainWave Cabinet) and as a single pallet with six (6) cardboard boxes. The contents of the cabinet and the boxes are listed below.

BrainWave Cabinet

Component	Qty	Avotec P/N	GE P/N
Response System Electronics	1	979101	2301428-9
Response System power supply	1	979103	
Response System serial cable to computer	1	979104	
Trigger Converter	1	749002	2301428-10
BNC cable, trigger converter to response system	1	520421	
Stimulus Computer (PC)	1	NA	2303343-2
AC power cord	1	NA	
VGA cable, computer to Video Interface	1	522004	
Video Interface	1	741022	
AC power cord	1	529910	
Graphic Equalizer	1	990355	2301428-24
1/4" to phono converter	4	560202	
1/8" to phono cable	2	560201	
Power strip	1		

Box 1 Cable box

Component	Qty	Avotec P/N	GE P/N
Cable, DC power, Video Interface	1	758617	
Cable, DC power, Projector	1	758618	
Cable, fiber optic, visual system	1	758615	
Custom ramp port panel	1	749986	
Y-cable	1	749003	
sub-D M/F cable	1	520422	
Screw lock connector	2	197113	
Monitor mounting kit	1	980262	

Box 2 Silent Scan (audio system) master carton

Component	Qty	Avotec P/N	GE P/N
Audio Console	1	721102	2301428-22
AC power cord	1	529910	
Stereo Interface cable	1	721500	
Audio Transducer	1	722102	2301428-20
Tubing assembly	1	723100	2301428-18
Tubing assembly, research	1	723101	2301428-19
Full Coverage Headset	1	723200	2301428-16
Stethoscopic Headset	1	723300	2301428-14
Covers, Full Coverage Headset	50	962050	
Eartips, Stethoscopic Headset	50	961100	
Silent Scan manual	1	975154	

Box 2A Silent Scan cable box (inside Box 2)

Component	Qty	Avotec P/N	GE P/N
cable, DC power, console	1	758620	
Cable, DC power, magnet	1	758619	
Cable, stereo extension	1	560213	

Box 3 BrainWave Cart

Component	Qty	Avotec P/N	GE P/N
BrainWave Cart	1	980160	
Split tubing (cable wrap)	1	536010	

Box 4 SV Projector/IG/Glasses

Component	Qty	Avotec P/N	GE P/N
SV projector / IG / glasses	1	745113	2301428-31
Silent Vision Manual	1	975321	

Box 5 SV Glasses Mount

Component	Qty	Avotec P/N	GE P/N
SV glasses mount	1	745403	2301428-11

Box 6 Patient Response system

Component	Qty	Avotec P/N	GE P/N
Response Pad assembly	1	979102	2301428-8
Fiber optic cable	1	979106	

1-3 Tools Required

- #2 Flat head Screwdriver
- #2 Phillips Screwdriver
- adjustable wrench
- 3/8" box wrench
- Rubber hammer or standard hammer and wood block (cart assembly).

1-4 Summary of Tasks

- Install BrainWave Cabinet
- Install Custom Ramp Port Sub-panel
- Install Equipment Room Cables
- Route visual system DC power cable from Penetration Panel to BrainWave Cabinet.
- Route visual system fiber optic cable from Penetration Panel to BrainWave Cabinet.
- Route response system fiber optic cable from Penetration Panel to BrainWave Cabinet.
- Route audio system DC power cable from Penetration Panel to control room.
- Route stereo extension cable from BrainWave Cabinet to control room.
- Route network cable from BrainWave Cabinet to control room.
- Install trigger cable assembly in Systems Cabinet.
- Add sub-D cable to Systems Cabinet and route to BrainWave Cabinet.

2- BRAINWAVE HARDWARE INSTALLATION

2-1 Cabinet Installation

Summary:
The cabinet must be installed in the equipment room and close to the Systems Cabinet. The BrainWave option's power and trigger comes from the Systems Cabinet.

2-1-1 Install BrainWave Cabinet

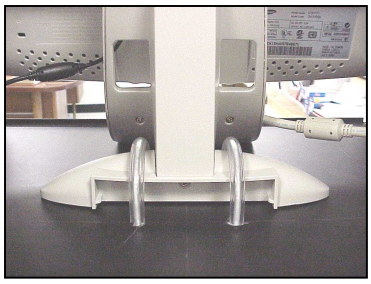
1. Locate BrainWave Cabinet. Standard lengths (15 feet) of power strip cord and sub-D cable from BrainWave Cabinet to Systems Cabinet should be considered, as well as customer preference.
2. Level BrainWave Cabinet.

BrainWave Cabinet
Illustration 2-1

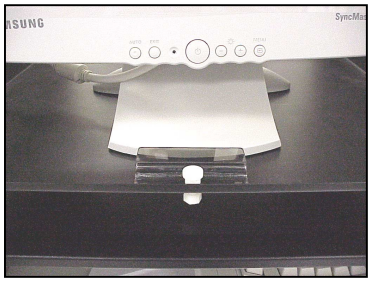
2-1-2 Install LCD Monitor

Note: Right hand side (RHS) / Left hand side (LHS) are referenced to back view of cabinet.

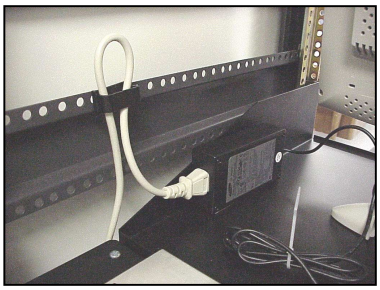
1. Unpack LCD monitor, AC/DC power supply, and mounting kit (980262) from Box 8.
2. Mount the LCD monitor on the top shelf of the cabinet using monitor hardware kit.
3. Place monitor on top shelf.
4. Locate (2) U-bolts as shown in Illustration 2-2. Locate front bracket as shown in Illustration 2-3.
5. Use 3/16" wrench to tighten nuts on U-bolts. Hand-tighten front bracket thumb screw and nut.
6. Route monitor VGA cable down RHS of cabinet to Video Interface box (Silent Vision).
7. Place monitor power supply on LHS of cabinet shelf (Illustration 2-4).
8. Connect AC power cord to power supply.
9. Connect DC power cord to LCD monitor.
10. Remove adhesive cover strip on power supply and attach power supply to shelf.



Monitor Base (Rear)
Illustration 2-2



Monitor Base (Front)
Illustration 2-3



Monitor Power Supply
Illustration 2-4

2-1-3 Install Keyboard and Mouse

1. Remove tape at front of BrainWave Cabinet restraining slide-out shelf.
2. Unpack keyboard and mouse from Box 9 and place on slide out shelf.
3. Route keyboard and mouse cables straight back and down to computer.
4. Plug keyboard and mouse connector into PC.
5. Route excess cable down LHS of cabinet.

2-1-4 Plug Power Cords into AC Power Strip

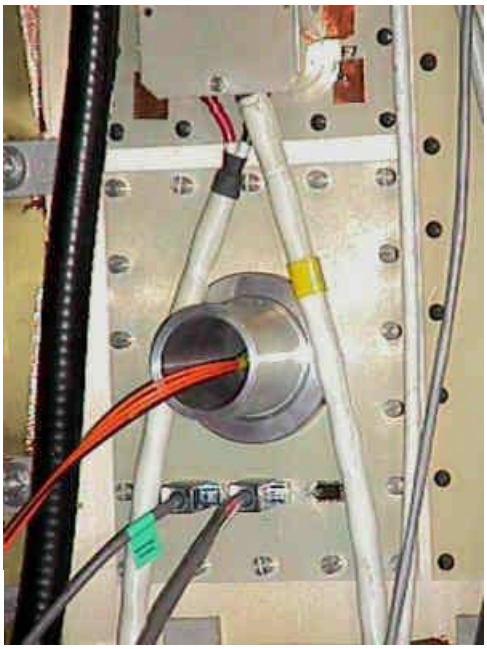
Undo the bundle of (4) AC power plugs inside the base of the cabinet, and plug into power strip.

2-2 Ramp Port Installation

Summary:
The original ramp port sub-panel must be removed and replaced with the custom ramp port to allow cabling into the magnet room.

1. Remove the contents of Box 2. Place all cables aside, and take the custom ramp port panel.
2. Install the custom ramp port panel (749986) in place of the standard panel. See Illustration 2-5.

Note: If the ramp-port panel has pre-existing (custom) modifications, they must be re-applied to the sub-panel **before** installation time.



Custom Ramp Port Panel
Illustration 2-5

2-3 BrainWave Cables Installation

2-3-1 Penetration Panel to BrainWave Cabinet Cable Routing

1. Route the audio DC console cable (758620), Video Interface DC power cable (758617), visual system fiber optic cable (758615) and patient response fiber optic cable (979106) from the Penetration Panel to the BrainWave Cabinet. Refer to Cable Interconnect Diagram at the end of this manual.
2. Route the fiber optic cables into the magnet room through the waveguide on ramp port panel. Refer to Illustration 2-5.
3. Complete the DC power DB-9 connections for the audio and visual system by connecting to the specified filters mounted on the custom ramp-port panel. The audio DC console cable connects to the left-hand filter; the visual interface DC power cable connects to the right hand filter. Directions are relative to facing the panel in the equipment room.

Warning: Do not mismatch audio and visual DC power cables across Pen Panel!!!

2-3-2 Route Cables from BrainWave Cabinet to Control Room.

1. Route the audio DC console cable (758620), the stereo extension cable (560213), and the network cable (758616) from the BrainWave Cabinet to the operator's console.

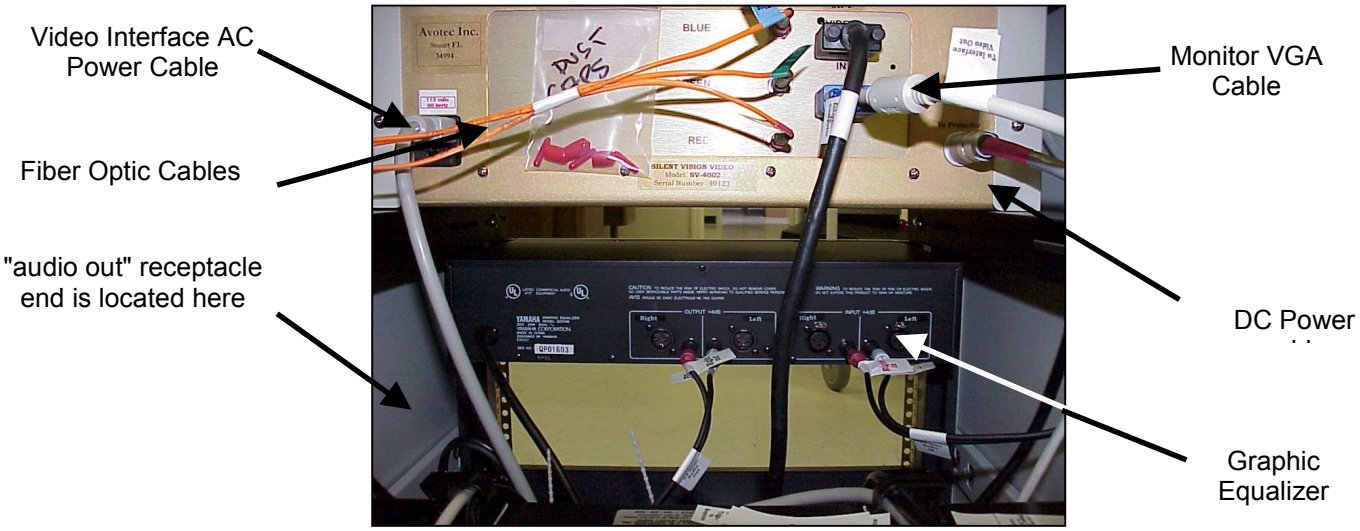
2-3-3 Connect the Video Interface

1. Route the Video Interface DC power cable (758617) up the RHS of the cabinet. Connect the power cable to "to projector" input on the Video Interface box.
2. Connect the monitor VGA cable to "video output" on the Video Interface box.
3. Route the video system fiber optic cable (979106) up the LHS of the cabinet to the Video Interface.

4. Remove the dust covers from the ST connectors on the Video Interface (NOTE: refer to proper technique as outlined in Silent Vision Operating Manual (Box 3).
5. Connect each red, green and blue fiber optic ST connector to the correct output on the Video Interface.
6. Store the dust covers in the ziploc bag on the back of the Video Interface (needed to protect the connectors when shipping Video Interface box).

2-3-4 Connect Audio System

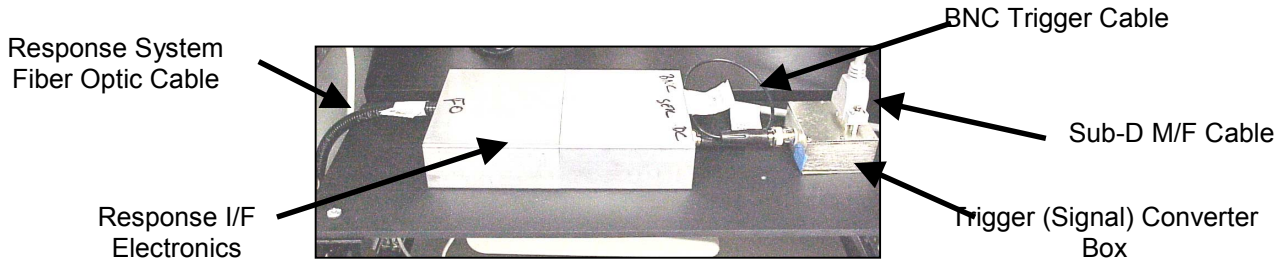
1. Route the stereo extension cable (560213) up the LHS of the cabinet to the Graphic Equalizer. Connect the stereo extension cable to the "audio out" cable end from the Graphic Equalizer (Illustration 2-6).



Video Interface Box and Graphic Equalizer Connections
Illustration 2-6

2-3-5 Connect Patient Response System

1. Route the response system fiber optic cable (979106) up the LHS of the cabinet and connect to the Response I/F Electronics module (Illustration 2-7).
2. Route the sub-D M/F cable (520422) up RHS side of cabinet and connect to the Trigger (Signal) Converter Box (Illustration 2-7).



Response I/F Electronics and Trigger Converter Connections
Illustration 2-7

2-3-6 Connect Computer to Network

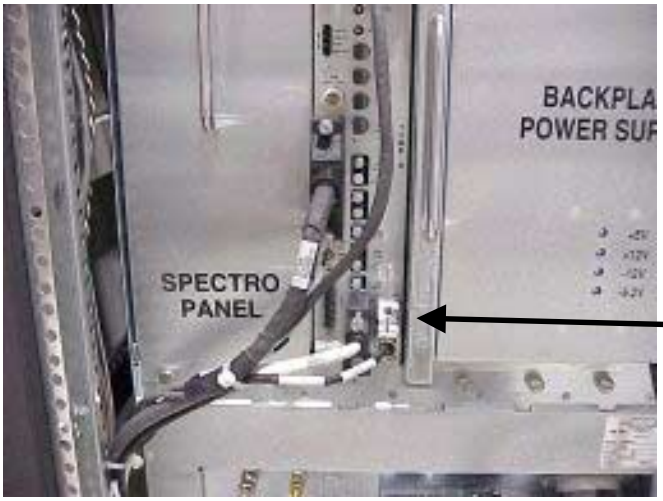
1. Route the network cable (758616) up RHS side of cabinet and connect to the computer.

2-3-7 Connect Trigger System

1. Open rear of Systems Cabinet and check for existing cable on J31 on Tyme II board. If cable does **not** exist, connect the Y-cable (749003) to J31 and do **not** connect BNC end of Y-cable. If cable does exist, remove cable and connect Y-cable to J31 of Tyme II and J1 to TNS. See Illustrations 2-8 and 2-9 for locations of J31 and J1.
2. Using the screw-lock connectors (197113), mount the female end of the Y-cable to an open DB-9 access hole from inside the rear panel at the bottom of the Systems Cabinet (Illustration 2-10).
3. Connect the female end of the DB-9 cable (520422) to the trigger converter box in the BrainWave Cabinet (Illustration 2-8). Route the DB-9 cable down the RHS of the BrainWave Cabinet and out the bottom of the cabinet.
4. Continue routing the DB-9 cable from the bottom of the BrainWave Cabinet to the bottom of the Systems Cabinet and connect to the female end of the Y-cable.

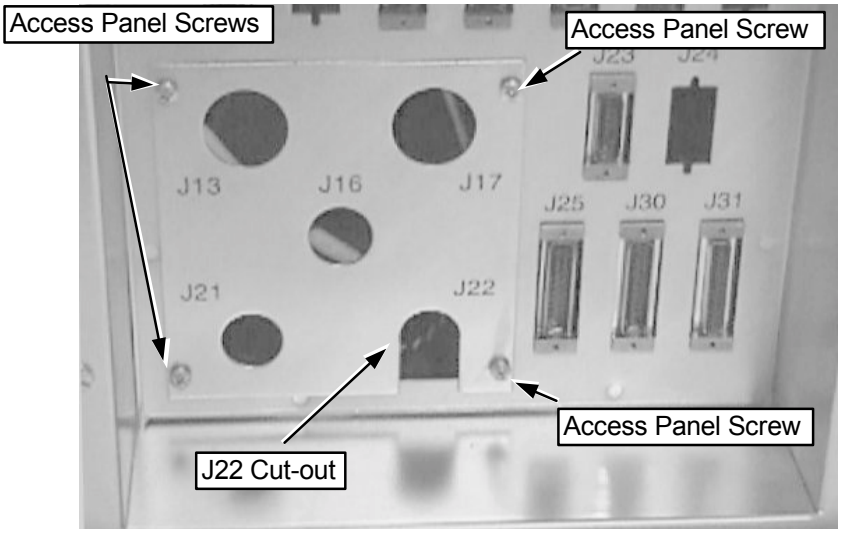
2-3-8 Connect Power Strip to Systems Cabinet

1. Remove base access panel at rear of Systems Cabinet.
2. Route cabinet Power Strip cable through J22 panel cutout (Illustration 2-10). Plug power cord into an open 15A outlet.
3. **Note:** Other uses of the 15A outlets are non-standard and should be evaluated for overall demand. The BrainWave option requires approximately 10A (steady state - assume 15A power-up demand). If there are other pre-existing users of 15A power, and all the 20A outlets are unused, the BrainWave option may be plugged into an open 20A outlet instead.
4. Reinstall access panel to System Cabinet I/F.



Tyme II Trigger Connection
Illustration 2-8

TNS Trigger Connection
Illustration 2-9



Systems Cabinet Access Panel
Illustration 2-10

2-4 Magnet Room Installation

Summary
The DC power cables for the audio and visual systems, as well as the fiber optic cables for the visual and patient response systems must be routed from the Penetration Panel to the BrainWave Cart. Based on customer selection, plan whether the cart will be positioned on the left or right side of the magnet. The BrainWave Cart must be assembled. The Visual Assembly Projector and the Audio Transducer must be mounted on the cart. Cable connections are then made to complete this portion of the installation.

2-4-1 Cable Routing from Penetration Panel to Magnet

1. Route the audio DC magnet cable (758619), projector DC power cable (758618), visual system fiber optic cable (758615), and response pad fiber optic cable (979106) from Pen Panel to BrainWave Cart.
2. The cables going to the cart will exit the magnet underneath one side of the magnet. Approximately 2 meters of cable will be exposed between the magnet and the cart. All excess magnet room cable should be stored near the Pen Panel - not underneath the magnet (i.e. avoid any cable "loops" near the magnet).
3. Complete the DC power DB-9 connections for the audio and visual system by connecting to the specified filters mounted on the custom ramp-port panel. The audio system cable connects to the right-hand filter; the visual system connects to the left hand filter. (Directions are relative to facing the panel in the magnet room).

Warning! Do not mismatch audio and visual DC power cables across Pen Panel!!

2-4-2 BrainWave Cart Assembly (Steps A-E)

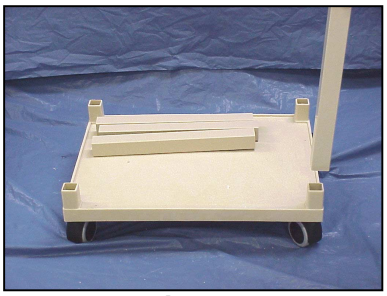
1. The BrainWave Cart is assembled from the ground upward. For reference, the end of the cart with the handles will be designated the "front" of the car. See Illustration 2-11.
2. Open Box 4. Remove the Transducer Bracket assembly (980164), the split cable covering (536010), and the cart pieces:
   - (1) bottom shelf, with (4) non-magnetic casters installed.
   - (1) middle shelf, with projector mounting plated installed.
   - (1) top shelf (with divider assembly and handle)
   - (8) column pieces
3. Attach (4) column pieces to the bottom shelf/caster assembly, using the hammer and wood section if necessary to completely seat the column pieces. **(A)**

4. Next set the middle shelf (with the projector mounting bracket attached) by placing it on the tops of the four columns extending from the bottom shelf. Push down on middle shelf until the shelf is completely seated on the four columns.

Note

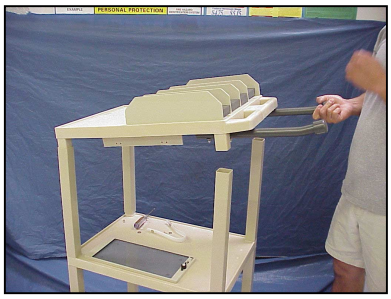
The front of the cart is defined as where the edge of the projector mounting bracket is furthest from the end of the shelf. **(B)**

5. Next set the top shelf (handles) by placing it on the tops of the four columns extending from the bottom shelf. The handles of the top shelf must be at the front of the cart. Push down on the top shelf until the shelf is completely seated on the four columns. **(C)**
6. Attach the Transducer Bracket assembly to the cart using the (4) nylon thumbscrews provided. **(D)** , **(E)**



A

B



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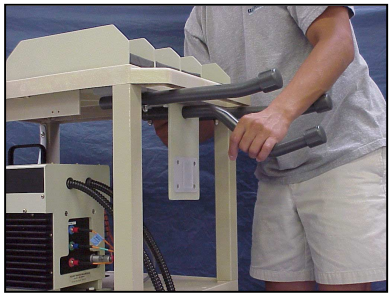

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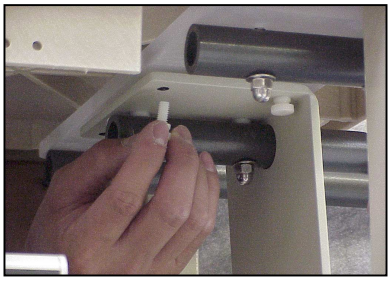


E

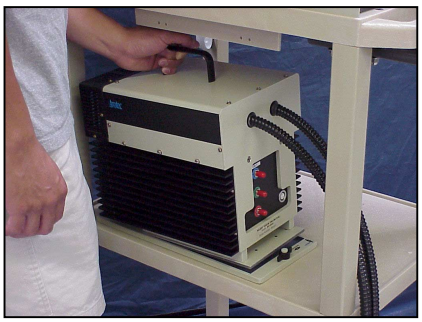
Cart Assembly
Illustration 2-11

2-4-3 Projector Installation

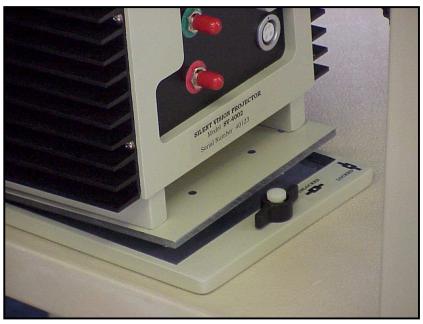
1. Unpack Box 5 and carefully remove the Visual Display (visual projector / image guide / glasses) assembly. **CAUTION: Do not remove the glasses from the protective case.**
2. Carefully mount the Visual Projector in the projector base assembly, and lock into place. (Illustration 2-12, 2-13).

WARNING: The projector is heavy, and the image guides are fragile.

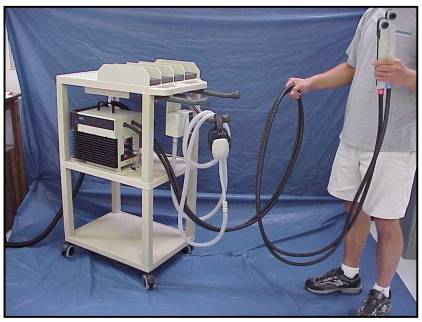
3. Carefully straighten out the image guides by rotating the glasses case until the image guides are lying parallel. While holding the glasses case in one hand, take the image guides in the other hand, make a single loop over the image guide hooks, and place the glasses case in the divider assembly (Illustration 2-14, 2-15).



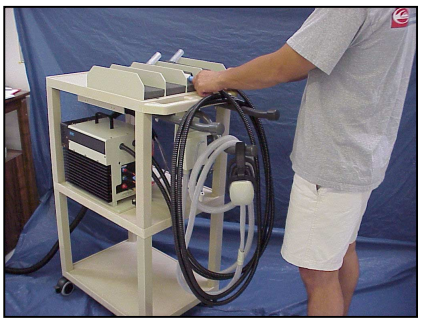
Fitting Projector Into Base Plate
Illustration 2-12



Locking Projector into Base Plate
Illustration 2-13



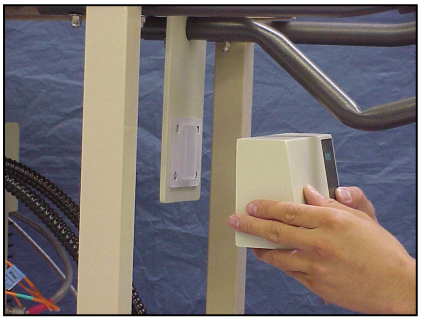
Forming Image Guide Loop
Illustration 2-14



Storing Image Guides and Glasses
Illustration 2-15

2-4-4 Audio Transducer Installation

1. Remove the Audio Transducer (722102), (mesh covered) Tubing Assembly (723100), Full Coverage Headset (723200), and Stethoscopic Headset (723300) from Box 3.
2. Attach the Audio Transducer to the Transducer Bracket assembly by sliding the transducer down over the bracket (Illustration 2-16).
3. Remove the red dust cover from the Audio Transducer. Connect the Tubing Assembly to the Audio Transducer by carefully inserting one end of the Tubing Assembly into the transducer receptacle. Make sure that the Tubing Assembly is completely seated in the receptacle (Illustration 2-17).
4. Connect the Full Coverage Headset to the Tubing Assembly. Loop the Tubing Assembly over the hook from the Transducer Bracket assembly. Hang the Full Coverage Headset on the hook. Hang the Stethoscopic Headset in the bracket mounted to the front of the transducer.



Installing Audio Transducer
Illustration 2-16

Connecting Tubing Assembly
Illustration 2-17

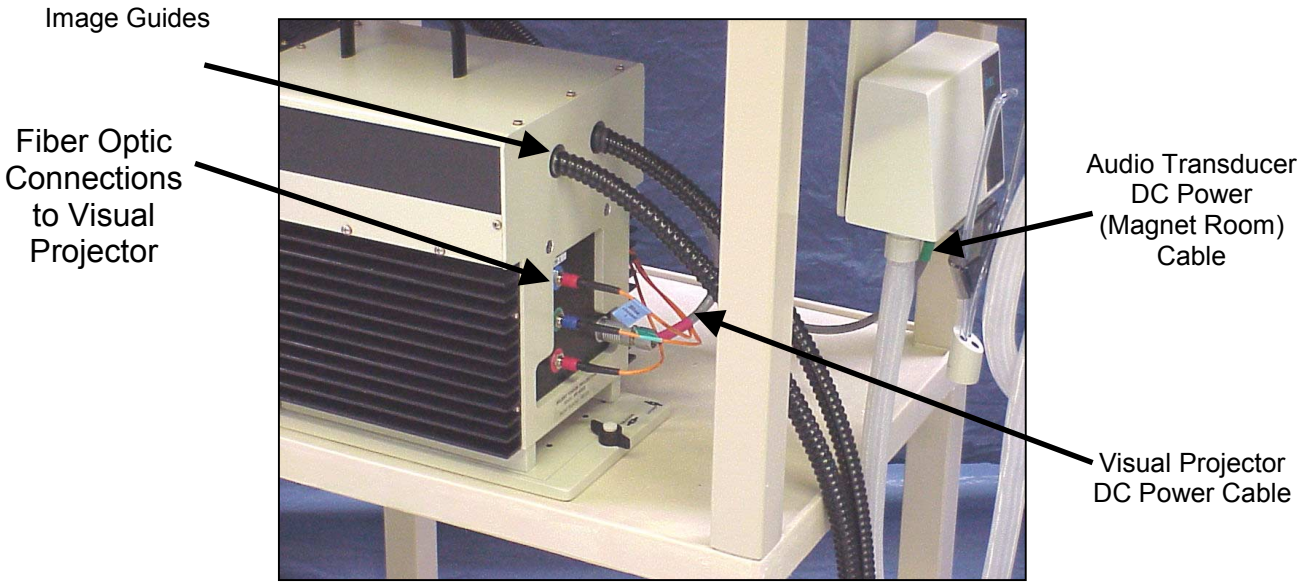
2-4-5 Patient Response Pad Installation

1. Remove the Patient Response Pad assembly (979102) from Box 7.
2. Loop the assembly onto the Audio Bracket hook. Extend the connector end of the assembly to the back of the cart.

2-4-6 Cable Connections

1. Plug the (red) projector DC power cable (758618) into the projector (Illustration 2-18).
2. Remove the dust covers from the ST connectors on the projector (NOTE: refer to proper technique as outlined in Silent Vision Operating Manual). Connect each red, green and blue fiber optic cable (758615) ST connector to the correct input on the projector
3. Plug the (green) audio DC magnet cable (758619) into the Audio Transducer (Illustration 2-18).
4. Plug the end of the response pad assembly (979102) into the response fiber optic cable (979106).

5. Use the split tubing (536010) to gather the cables exiting from the magnet to the cart. Leave about six inches of tubing extending into the cart area.
6. Open the cable clamp bracket located on the cart, clamp the split tubing shrouded cables in the bracket, and close the bracket.



Visual Projector and Audio Transducer Connections
Illustration 2-18

2-5 Control Room Installation

Summary

The customer determines the location of the Audio Console on the Operator Workspace table, although the recommended position is between the scanner and AW keyboards.

2-5-1 Install Audio Console and Network Connection

Note

Refer to the procedures outlined in the Silent Scan Operations Manual.

1. Remove the Audio Console (721102), AC power cord (529910) and stereo interface cable (721500) from Box 3.
2. Position the Audio Console at the Operator Workspace per customer desire.
3. Connect the AC power cord, the stereo interface cable (yellow), and the audio DC power cable (green) to the Audio Console.
4. Connect the AC power cord for the Audio Console to an open outlet on the power strip contained inside the OW Computer (Duplex) Cabinet.
5. While the OW Computer Cabinet is open, also connect the network cable (758616) to an open port on the OW Network Hub.
6. Connect the stereo extension cable (560213) to the stereo interface "CD" input.

Note:

Any of the three inputs can be used; simply set the selector switch to the correct position. This will be decided by the customer.

3- POWER UP PROCEDURE AND BASIC HARDWARE SYSTEM CHECKS

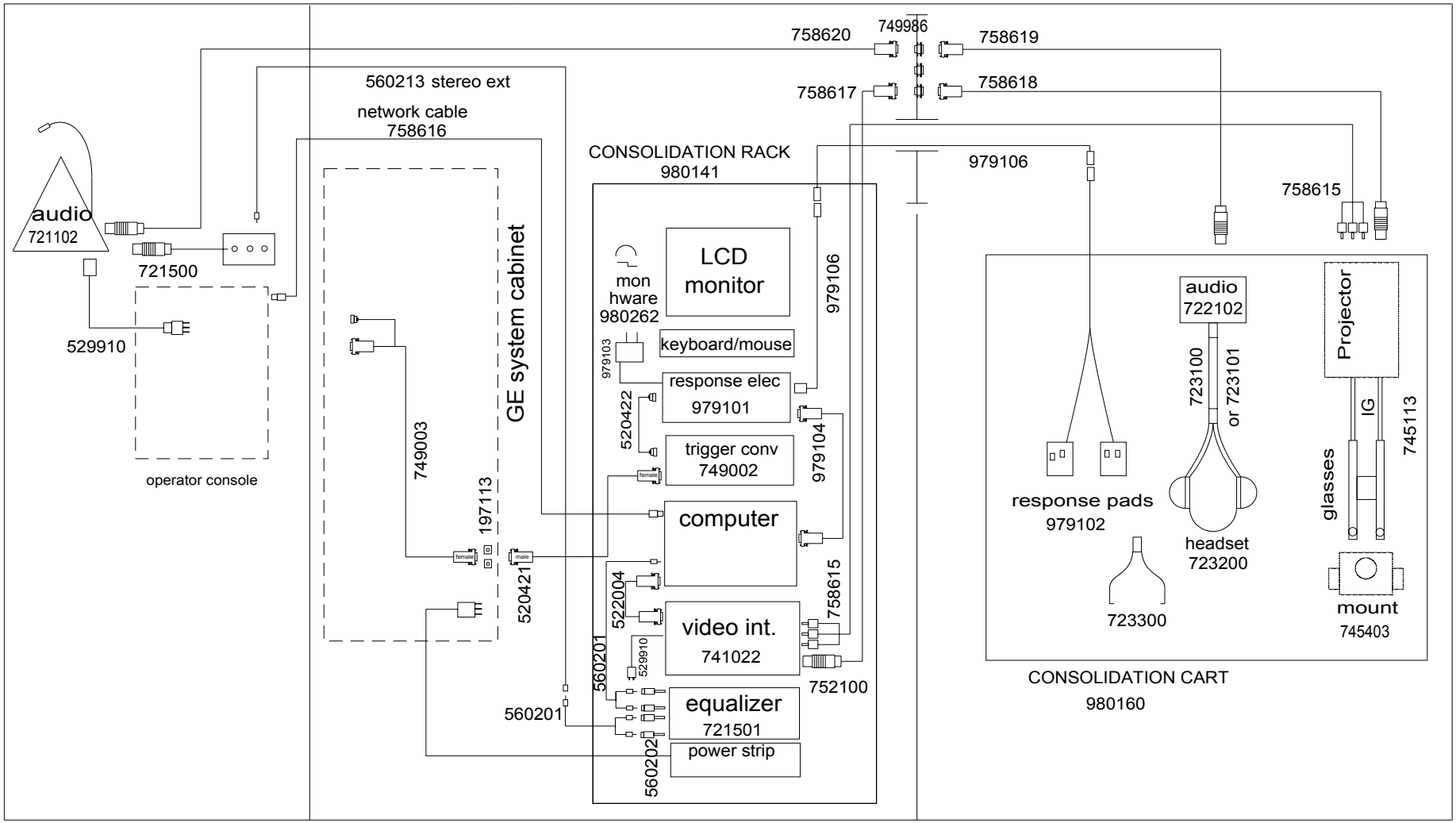
Procedure

1. From Equipment Room BrainWave Cabinet, power up the power strip (back of cabinet), the Graphic Equalizer, the Video Interface, the Stimulus PC and the LCD monitor. Note the network cable should still be disconnected. (See BrainWave software installation documentation for setting an appropriate IP address for the Stimulus PC prior to connection to the customer's network). Log on as system administrator, no password.
2. Windows NT boot sequence on PC should be visible. This sequence has completed successfully if the stimulus application begins to run automatically as evidenced by the display of four boxes in the center of the screen whose colors change continuously. If the PC fails to boot properly refer to the BrainWave software installation and troubleshooting documentation.
3. Go to the magnet room and check to see if the "changing boxes" pattern is visible through the glasses (temporarily remove glasses from shipping case). If not, check that the Video Interface is plugged in and turned on. Check that the visual power cables are properly connected at both sides of the Penetration Panel, as well as to the Video Interface and Visual Projector. If power is getting to the projector, bright light should be visible from the internal halogen bulbs of the projector.
4. If power is present, check that the three RGB fiber optic cables are properly connected between the projector and the Video Interface unit. Check that the VGA cable is properly connected between the Video Interface and the PC. The three green LED's on the front panel of the Video Interface should be lit.
5. Press the Response Pad buttons in the magnet room, and have an independent observer at the BrainWave Cabinet observe the R/G/B/Y LED's on the Response Interface box respond accordingly. If not, check that power is reaching the Response Interface box from the cabinet power strip. Also check that the response fiber optic cable is properly connected at the Response Interface box and the Response Pad assembly, as well as at the mating connection.
6. Connect the provided “service” headphones (provided with Stimulus PC) to the output of the PC sound card and verify that stereo sound is being delivered to the headphones (a background "audio loop" associated with the "changing boxes" state of the stimulus PC application. Adjust the volume and balance via the PC software controls. Reconnect the output of the PC sound card to the graphic equalizer input.
7. Move to the Operator Workspace and turn the Audio Console power on. Immediately press the momentary microphone switch down to cancel the beep tone associated with a successful power on test. If this test fails, check that the console power is properly plugged into the 120 VAC outlet inside the OW Computer Cabinet.

8. Ensure the Audio Console is in "clinical" (not "functional") mode via the two switches "up" on the backside of the unit. Press the microphone button down and talk into the microphone while someone is listening to the BrainWave headphones in the magnet room. If this test fails, check that the cables between the console and Penetration Panel, Pen Panel to Audio Transducer, and audio tubing connections to the headphones are all properly connected.
9. Have the person wearing the BrainWave headphones speak, making sure they can be heard at the Audio Console. Adjust the patient volume until they can be clearly heard. (If feedback occurs between the GE console and the BrainWave Audio Console, check that the tubing assembly is securely seated in the Audio Transducer receptacle). If the person wearing the headphones cannot be heard, check all cable and tubing connections.
10. Place an audio CD in the PC CD drive. Move the three position microphone switch to the "music" position. The person wearing the headphones should be able to hear the music. If this fails, check that the Audio Console music source setting (CD/tape/radio) corresponds to the connection used on the stereo interface box. Check that all connections from the Audio Console to the Graphic Equalizer are properly connected (PC sound output to Graphic Equalizer input, Graphic Equalizer output to Audio Console input via stereo interface box). Insure that power to the Graphic Equalizer is ON.

4- INTERCONNECT DIAGRAM

STIMULATION SYSTEM, COMPLETE (996104)



DWG: GE-SYS-003			P/N: 996104
Release Date: 10/4/01		App:	SHEET:
Rev:	Date:	App:	ECO
Rev:	Date:	App:	ECO
Rev:	Date:	App:	ECO

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