JBL SYNTHESIS

DIGITAL ACOUSTIC CALIBRATION SYSTEM (DACS)

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INSTALLER'S MANUAL

Manual abstract:

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SECTION 1 - IINTRODUCTION This document contains reference material s pertaining to the use of the Synthesis Calibration Kits. It is assumed that the reader is experienced in the best results while still conforming to the architectural limitations inherent in the installation. CENTER MAIN 1. If the speaker is behind a perforated screen, place it as far forward as possible, nearly touching the screen. 2. If it is above or below the screen, it must be placed as close as possible to the edge of the screen, along the same plane as the screen. 3. If it is on a shelf, in a pre-fabricated hole in the wall or in a cabinet opening, place it as far forward as possible.

3.1. Any gap around the speaker must be filled. If the gap is ½" closed-cell foam can be used. For gaps greater than ½" it is recommended that you "frame" the speaker with ¾" MDF, plywood or other solid panel material.

4. Do not allow anything to obstruct the baffle area of the speakers. 4.1. If decorative cloth is placed in front of the speakers, be sure the frame for the cloth does not obstruct the front of the speaker.

3 LEFT AND RIGHT MAINS 1. If the speaker is on a shelf, in a pre-fabricated hole in the wall or in a cabinet opening, place it as far forward as possible. 1.1. Any gap around the speaker must be filled. If the gap is ½" closed-cell foam can be used. For gaps greater than ½" it is recommended that you "frame" the speaker with ¾" MDF, plywood or other solid panel material.

2. Do not allow anything to obstruct the baffle area of the speakers. 2.

1. If decorative cloth is placed in front of the speakers, be sure the frame for the cloth does not obstruct the front of the speaker. SUBWOOFERS 1. In nearly all cases, the best location for subwoofers is on the floor, in the front corners of the room. Place them with the woofers facing the listening area. 1.1. If the subwoofers cannot be placed in the corners, the next best position is on the floor, against the front wall. In this instance, better low frequency coupling may be achieved by turning the subwoofers sideways such that the drivers and ports are next to the front wall. 2. If the subwoofers are placed in a pre-fabricated hole in the wall or in a cabinet opening, place them as far forward (toward the opening) as possible. 2.1. Any gap around the subwoofer must be filled. If the gap is ½" closed-cell foam can be used.

For gaps greater than ½" it is recommended that you "frame" the speaker with ¾" MDF, plywood or other solid panel material. 2.2. Do not allow anything to obstruct the driver or ports of any speakers. 2.

3. If decorative cloth is placed in front of the speakers, be sure the frame for the cloth does not obstruct the driver or ports of the subwoofers. SURROUND SPEAKERS Wall Mount 1. Side surround speakers are to be mounted vertically and placed directly at the sides of the listening area. 2. Rear surround speakers are to be mounted vertically and placed on the rear wall of the listening area. 3. The bottom edge of all surround speakers must be at least 24" above ear level. 3.1.

Avoid elevating surround speakers more than 48" above ear level. 4. If the speaker is on a shelf, minimize the width and depth of the shelf as much as possible. 4.1. Place them against the wall. 5. If they are placed in a pre-fabricated hole in the wall or cabinet opening, it must exceed the speaker width by no less than 24". 5.1.

Center the speaker in the opening. 5.2. Any open area behind the speaker must be filled to minimize acoustic resonances. 6.

Do not allow anything to obstruct the drivers. 6.1. If decorative cloth is placed in front of the speakers, be sure the frame for the cloth does not obstruct the drivers. 3 Ceiling Mount TAKE NO CHANCES! The mounting hardw are provided w ith Synthesis surround speakers I S N O T suitable for ceiling installation.

Improperly suspended speakers represent a serious safety hazard w hich can result in injury or death. 1. Side surround speakers are to be mounted with the top of the enclosure facing the center of the room, as near to the adjacent wall as possible. 2. Rear surround speakers are to be mounted with the top of the enclosure facing the video display screen, as near to the adj acent wall as possible. 3. If they are placed in a pre-fabricated hole or cutout in the ceiling, it must exceed the speaker width by no less than 24". 3.1. Center the speaker in the opening.

3.2. Any open area behind the speaker must be filled to minimize acoustic resonances.

4. Do not allow anything to obstruct the drivers. 4.1. If decorative cloth is placed in front of the speakers, be sure the frame for the cloth does not obstruct the drivers. 3 SYSTEM INTERCONNECTION DIAGRAMS Figure 2: Synthesis Two and Three Control Wiring Diagram 3 Figure 3: Synthesis Two and Three Interconnect Wiring Diagram 3 Figure 4: Synthesis One Control Wiring Diagram 3 Figure 5: Synthesis One Interconnect Wiring Diagram 3 AMPLIFIER AND SDEC SWITCH SETTINGS Figure 6: Component Sw itch Settings 3 SECTION 3 - P R E - C A L IIB R A T IIO N PRE CAL BRAT ON RESTORE PROCESSOR DEFAULT SETTINGS Th i s i s a p p l i c a b l e t o a l l S y n t h e s i s m o d e l s e q u i p p e d w i t h a n S D P - 2 , S D P - 2 D o r S D P - 3 processor. It is recommended that you restore the Surround Processor to the factory default settings p r i o r t o s y s t e m c a l i b r a t i o n . Th i s w i l l e n s u r e t h a t y o u d o n o t w a s t e t i m e l a t e r t r o u b l e s h o o t i n g a n a p p a r e n t p r o b l e m , o n l y t o f i n d t h a t t h e P r o c e s s o r s e t t i n g s w e r e t h e c a u s e . 1. 2. 3. 4.

5. 6. 7. Use the remote control to turn the processor OFF. Use the remote to turn the processor back ON.

Immediately press and hold the MUTE button on the remote control. I n a f e w s e c o n d s , t h e " F A C TO R Y P R E S E T S ME N U " w i l l a p p e a r o n t h e P r o c e s s o r ' s r e a d o u t . Release the MUTE button. S c r o l l t o a n d s e l e c t " R E S TO R E D E F A U L TS " . W h e n t h e m e s s a g e " F A C TO R Y D E F A U L TS R E S TO R E D " i s d i s p l a y e d p r e s s D O N E t o r e t u r n to normal operation. A l t e r n a t i v e l y , yo u c a n a d j u s t e a c h s e t t i n g m a n u a l l y . Th e y s h o u l d b e s e t a s f o l l o w s : A. Volume Control: 0dB B. Speaker Configuration: L E F T - C E N TE R R I G H T: S m a l l , 8 0 H z h i g h - p a s s LEFT & RIGHT SIDE: Small dipole, 80Hz high-pass. B A S S S P L I T: 8 0 H z REARS: None S U B W O O F E R : Ye s , C r o s s o v e r = 8 0 H z .

C. All outputs levels set to 0.0dB D . S U B W O O F E R P E A K L I MI TE R : O F F E . E Q U A L I Z A TI O N . . . BASS: 0dB TR E B L E : 0 d B TI L T: 0 d B LOUDNESS: OFF F . L I S TE N E R P O S I TI O N : 3 ' G. PRO-LOGIC.

. . A U TO A Z I MU TH : O F F DIALOGUE ENHANCE: 0dB EFFECT LEVEL: 0dB SUBW OOFER LEVEL: 0dB SURROUND LEVEL: 0dB H . S TE R E O B YP A S S . .

. SUBW OOFER LEVEL: 0dB 3 SPEAKER PHASE TESTS F o r t h i s o p e r a t i o n , y o u w i l l u s e t h e p h a s e t e s t e r p r o v i d e d . I f y o u a r e u n f a m i l i a r w i t h t h i s i n s t r u m e n t , r e f e r t o " U S I N G TH E P H A S E TE S T E R " o n P g . 1 9 . A l w a y s t u r n t h e a m p l i f i e r p o w e r o f f b e f o r e c h a n g i n g i n p u t c o n n e c t i o n s .

1. 2. U s e t h e s u p p l i e d f e m a l e XL R t o R C A a d a p t e r c a b l e p r o v i d e d i n t h e k i t . Connect the phase tester's output to the amplifier input corresponding to the channel you are going to test. Sometimes access to the amplifier inputs is nearly impossible. In such situations, use t h e " A l t e r n a t e P h a s e Te s t Me t h o d " d e s c r i b e d b e l o w. 3. 4. 5. P o w e r - u p t h e a m p l i f i e r a n d s e t t h e C r i c k e t - S o u t p u t l e v e l t o l o w o r h i g h a s r e q u i r e d t o g e t a clearly audible click from the speaker.

P o i n t t h e r e a r p a n e l o f t h e C r i c k e t - R t o w a r d t h e d r i v e r a n d s l o w l y m o v e t h e r e c e i v e r c l o s e r to the speaker. A t a d i s t a n c e o f a p p r o x i m a t e l y t h r e e t o s i x i n c h e s f r o m t h e d r i v e r y o u s h o u l d b e g i n t o o b s e r v e a p o l a r i t y i n d i c a t i o n . Yo u m a y h a v e t o a d j u s t t h e r e c e i v e r ' s g a i n c o n t r o l t o g e t a stable, repeatable indication. W hen the polarity indication is stable, check your test result against the phase table on t h e n e x t p a g e . 6. ALTERNATE PHASE TEST METHOD Th i s p r o c e d u r e u s e s t h e S u r r o u n d P r o c e s s o r t o r o u t e t h e p h a s e t e s t e r ' s o u t p u t t o t h e a p p r o p r i a t e c h a n n e l f o r t e s t . U s i n g a " Y " a d a p t e r , c o n n e c t t h e p h a s e t e s t e r ' s o u t p u t t o b o t h c h a n n e l s o f t h e TA P E i n p u t . S e l e c t t h e TA P E i n p u t , u s e t h e S u r r o u n d P r o c e s s o r ' s v o l u m e c o n t r o l t o s e t t h e t e s t l e v e l . U s e t h e f o l l o w i n g t a b l e t o r o u t e t h e s i g n a l a s n e e d e d . To Test.

. . LF and RF CF LA and RA Use Mode. . .

2-CHANNEL PRO-LOGIC P A R TY 3 Correct Speaker Phase U s e t h e p h a s e t e s t e r t o c o n f i r m t h e f o l l o w i n g d r i v e r p o l a r i t i e s . . . Synthesis One: L-C-R Horns (+) L - C - R Mi d - b a s s d r i v e r s (+) S u b wo o f e r s (+) Synthesis Two: L - C - R Ma i n H o r n s (-) L - C - R Ma i n m i d - b a s s d r i v e r s (+) S u b wo o f e r s (+) Synthesis Three: L - C - R Ma i n H o r n s (+) S u b wo o f e r s (+) Surround Speakers R e g a r d l e s s o f m o d e l , t h e r e a r e t w o a c c e p t a b l e m e t h o d s o f p h a s i n g t h e s u r r o u n d s p e a k e r s . CONFIGURATION ONE is the default method.

In some installations, CONFIGURATION TWO may be preferable. Figure 6: Surround sp eaker polarity configurat ions 3 USING THE PHASE TESTER Figure 7: Galaxy Audio phase test er. Th e G a l a x y A u d i o p h a s e t e s t e r c o n s i s t s o f t w o b a t t e r y o p e r a t e d i n s t r u m e n t s , C r i c k e t - S i s t h e "sender", Cricket-R is the "receiver". Cricket-S Th e s e n d e r g e n e r a t e s a s h o r t d u r a t i o n , p o s i t i v e p o l a r i t y p u l s e . Th i s i s a p p l i e d t o t h e p o w e r a m p l i f i e r i n p u t w h i c h d r i v e s t h e l o u d s p e a k e r b e i n g t e s t e d . C o i n c i d e n t w i t h t h e g e n e r a t i o n o f e a c h p u l s e , a g r e e n L E D i s i l l u m i n a t e d . Th r e e o u t p u t c o n n e c t o r s a r e l o c a t e d o n t h e r e a r p a n e l . L i n e l e v e l m a l e XL R , l i n e l e v e l f e m a l e ¼" p h o n e j a c k a n d a s p e a k e r l e v e l f e m a l e ¼" p h o n e j a c k . A f e m a l e XL R t o R C A a d a p t e r c a b l e i s p r o v i d e d i n t h e k i t . P l u g t h i s c a b l e i n t o t h e XL R c o n n e c t o r a n d u s e i t t o c o n n e c t t h e s e n d e r t o e a c h c h a n n e l f o r t e s t .

O n t h e f r o n t p a n e l a r e t w o s l i d e s w i t c h e s a n d a p u l s e i n d i c a t i n g L E D . S l i d e t h e O N / O F F s w i t c h t o t h e O N p o s i t i o n a n d t h e o u t p u t s e l e c t o r t o t h e L O p o s i t i o n .

You should now hear pops at one second intervals from the speaker under test. If a higher level is required, set the output selector to HI. Cricket-R The receiver contains a microphone and phase analysis circuitry. Positive polarity is indicated by a green LED, negative by a red LED. Two input connectors and the microphone are located on the rear panel. There is also a switch marked "CON" (continuity) and "POL" (polarity). Place this switch in the "POL" position. On the front panel are two slide switches, a rotary gain control and the two phase indicating LEDs. Slide the right side switch to the ON position and place the left side switch in the MIC position. Now move the receiver's microphone toward the speaker being tested. When you are within three to six inches of the speaker you should begin to see a polarity indication. Adjust the gain control until a consistent indication of phase is realized. 3 TEST THE PHASE TESTER If you are having difficulty getting reliable phase information, or if the phase tester appears to be inoperative, perform the following tests.

Sender Test Turn the unit ON and select SPK (speaker) output. If the unit is working normally, you will hear a "pop" from the speaker (located in the top cover) and see the green LED flash at about one second intervals. If the unit does not work as described, replace the battery (standard 9 V) and try again. Receiver Test Turn the unit ON and select BAT (battery). The green LED should be fully illuminated; indicating the battery is in good condition.

If the LED is dim or does not light, replace the battery. Send-Receive Loop Test Turn both units ON. Set the receiver on MIC input and put the sender's output selector in the SPK position. Move the receiver's microphone one to two inches above the sender's speaker. Adjust the receiver's gain control until it's green LED flashes reliably whenever a pop is heard from the sender. This indicates that both phase test components are working correctly. If you cannot get a reliable, consistent phase indication during this test, do not use to measure the Synthesis speaker phase. 3 SOUND CHECK SYNTHESIS ONE 1. 2. 3.

Set the Processor to PRO-LOGIC mode. Use the circulating noise generator of the Surround Processor to confirm that all channels have output and that each speaker is connected to its corresponding channel. Determine that the drivers of the Left Front (LF) Center Front (CF) and Right Front (RF) channels are receiving the correct frequency range. Play track 36 of the Delos "Surround Spectacular" test disk provided. Wide-band pink noise is continuously panned across the three front channels. a. Disconnect the horn tweeters of the LF - CF - RF speakers. b. Temporarily turn the subwoofer amplifiers off. c. Play track 36. Only the 8" drivers should play. All three should sound substantially alike and should have considerable mid-range content. If one or all of them sounds very thin, check your wiring. d. Reconnect the tweeters and disconnect the mid-range speakers. Play track 36. All three tweeters should sound substantially alike and should have no mid-range content. If one of them sounds different from the others, check your wiring. SYNTHESIS TWO & THREE 1.

2. Set the Processor to PRO-LOGIC mode. Use the circulating noise generator of the Surround Processor to confirm that all channels have output and that each speaker is connected to its corresponding channel. Confirm Cinema to Music Mode Change (Cinema + Music system s only) 5 pin DIN style cables are used to communicate between Synthesis components. Check now to confirm they are all properly routed and the connectors are well seated. The control lines to the Left and Right main speakers are sometimes very long. To eliminate the difficulty of acquiring unusually long DIN cables, each Synthesis system includes 5-pin DIN to 5mm Phoenix connector adapters. The Phoenix connector will accept nearly any wire up to 18 ga. Figure 8: 5- pin DIN to Phoenix ad apter You may use these adapters to connect each main speaker to it's control line. The polarity of the incoming wire is unimportant.

Confirm that the wires are stripped at least ¼" and the retaining screws are well tightened. 3 USING THE SOUND LEVEL METER Each calibration kit includes either an analog or digital Radio Shack sound level meter (SLM). ANALOG SLM USE INSTRUCTIONS 1. Rotate the RANGE Selector clockwise one click to the BATTERY TEST position. Observe the meter indication. A reading anywhere within the red BATT TEST range indicates adequate battery power. If the indication is below this range, replace the battery before using the instrument. Now rotate the RANGE Selector clockwise to the desired range. The meter has a display range from -10 dB to +6 dB. See Fig. 8. The 0 dB point corresponds to the RANGE selected.

Therefore, if the 80dB RANGE is selected, a 0dB reading will equal 80dB. 2. Figure 9: SLM Faceplate Figure 10: Control Locations All instruments of this type are most accurate when operated in the upper end of the selected range. You should always use the lowest RANGE setting possible. For example, if you are balancing a system using the Surround Processor's noise generator (75dB) you would set the RANGE selector to 70dB. 3. 4. Slide the WEIGHTING Selector to "C" weighting for channel balance tests. "A" weighting cuts low frequencies. This will cause errors when measuring subwoofers. It is recommended that you slide the RESPONSE Selector to the SLOW position. This slows the meters response to sudden changes in sound level which can make average level readings difficult. 3 DIGITAL SLM USE INSTRUCTIONS 1. Turn the SLM on by rotating the RANGE Selector clockwise. Continue to rotate the RANGE Selector to the desired RANGE. All instruments of this type are most accurate when operated in the upper end of the selected range. You should always use the lowest RANGE setting possible. For example, if you are balancing a system using the Surround Processor's noise generator (75dB) you would set the RANGE selector to 70dB.

In the event you have selected a range that is too low, an OVER-RANGE condition is indicated by a flashing display. Select the next higher range. 2. 3. Press the WEIGHTING button to select "C" weighting for channel balance tests. It is recommended that you slide the RESPONSE Selector to the SLOW position. This slows the meters response to sudden changes in sound level which can make average level readings difficult. Check the display for a low battery indication. If the battery needs replacing, BAT will appear in the upper left-hand corner of the LCD display. Replace the battery if necessary. 4. Figure 11: Digital SLM 3 CORRECTING HUM PROBLEMS This information will help you avoid hum problems in any Synthesis Home Theater System installation. WHAT IS THE ORIGIN OF HUM? Whenever you interconnect two or more AC powered analog audio devices, you have the potential to generate audible hum. All audio signal devices must be referenced to "ground". This connection establishes a zero voltage "reference" point for the entire system. An "earth ground" connection is not necessary for an isolated piece of equipment. A portable tape player would be an example of such a situation. The need to connect stationary equipment to earth ground is based on safety concerns. It is essential that a path to earth ground be provided, as a drain of unwanted, potentially lethal current. Examples of this would be a lightening strike or an insulation failure within a piece of equipment. Since the system must be earth grounded to maintain safety (and in many states, to be legal), this is the logical place to begin. When two or more audio devices are interconnected, they must have precisely the same zero voltage reference point or you will encounter problems. Audible hum is an indication that one or more of the devices in the audio chain has a slightly different ground reference potential. This is what we must correct to eliminate audible hum. There are many "bad science" solutions out there. Please resist the temptation to experiment with them, ultimately, they will not be fully effective, in some instances equipment can be damaged, they may actually be illegal and in many cases are down right dangerous. DURING INSTALLATION: DO NOT isolate the third wire ground at the AC plugs. This is bad science! As stated above, this connection to earth ground is essential for safety. Instead, make sure this connection is as good as possible. The goal is zero resistance to the ground outlet.

Sometimes this requires tightening of the GREEN ground wire within the junction box. Whenever possible, try to connect all system power cords to the same AC feed. Connecting to another feed means the ground connections have to travel all the way back to the power distribution box before they meet. This adds resistance, and really increases the likelihood of encountering problems. Correcting the house wiring may not be an option, or may not prove effective. You do not need to correct the house wiring to get good results. If necessary, tie all of the system hardware together electrically so there is no ground potential difference between the various devices and the third wire ground of the AC outlet(s). Even a few micro-volts (μV) difference will be audible. This is why you must create the lowest possible impedance ground path between all of the equipment.

Zero impedance = zero volts.
If the system components are mounted in a metal equipment rack, a low impedance ground circuit can be achieved by using the rack itself. Most equipment racks and their hardware are painted or anodized. These finishes will prevent a good ground. When installing the equipment, file or spot sand the rack rails and each panel where they will contact each other, giving a clean, metal to metal contact. Be sure the panel hardware is tight.
3 Put shakeproof lock washers (sometimes called star washers) between the rack rails and the panel mounting screws. This will cut through the finish as you tighten the hardware, resulting in an excellent low-resistance connection. Any system components not being rack mounted may need a ground strap to ground them to the rack. Use at least 16 gage or heavier stranded wire with crimp-on ring lugs on the ends. Securely attach a ground strap to the chassis of each component, then to one of the rails of the equipment rack.
Use each ass is screw near the AC power inlet if possible. Make certain the finish on the component chassis and the rack rail is not insulating the connections. If mounting the devices in a metal equipment rack is not an option, you may need to fabricate ground straps and tie some or all of the devices together. Use 16 gage or heavier stranded wire, with crimp-on ring lugs at each end of the wires. In this instance you will want to create a "star" grounding pattern. This means that each device will have a ground wire attached directly to the same point on the Surround Processor, which serves as the center of the "star". In some installations, you may find it necessary to use a combination of both techniques described above. Whatever the details of the particular installation, you must reduce all ground path resistance to as close to zero as possible. This is the correct method of eliminating hum. Do not try to interrupt ground current by defeating the ground connection on the AC cords.

Although this does interrupt ground current, and sometimes appears to reduce the audible hum, you are actually creating a potential for much more serious problems associated with floating grounds. VIDEO DEVICES: Video devices are frequently connected to externally grounded sources, like cable TV service. Projectors are seldom installed close to the other equipment, so they are usually connected to a different AC circuit. This is a leading cause of ground current related problems. In the case of cable TV service, one solution is to strap the incoming cable shield directly to the system's AC receptacle ground. Another, perhaps easier approach is to install an RF isolation transformer. If the source of hum is the remote AC connection of the projector, the best solution is to pull a 12-gage ground wire along with the video cables. Connect this ground wire between the chassis of the projector and the chassis of the Surround Processor. 3 SECTION 4 - USING DACS 4 USING DACS INTRODUCTION Calibration of a Synthesis system is a multi-step process. First, we acquire test data, which accurately represents what is actually happening in the room. Second, we process this data to create a view relevant to what we hear. Third, this data is compared to the theoretical ideal. Finally, corrective action is taken to make the listening environment more closely match the ideal. Meaningful acoustic measurements cannot be accomplished by placing a microphone at a single position and running a test. The key premise of room equalization at low frequencies is that the equalization will be used only to correct response errors caused by room resonances.
It is not used to correct narrow, deep, dips or peaks caused by destructive acoustical interference. A measurement made at a single point cannot discriminate between room mode resonances and destructive interference. The only effective method of separating room resonances from interference is to sample the acoustic energy at several points in the room.
ABOUT DATA ACQUISITION DACS 4 employs five microphones, distributed throughout the listening area. When the data acquired from these microphones is spatially averaged, the resultant curve has effectively "averaged out" most of the destructive interference components while reporting room modes.
This is because destructive interference phenomena occupy very small spaces within the room.
@@@@@@@@@@@@@@@@@@@@Serious component damage may result! @@@@@@Here are some locations to avoid: 1. 2. 3. 4. 5. 6. @@@@Some low level AC induced noise is normal. @@@@@@1. 2.

3. @@@@@@@@When boot-up is complete, there will be a message on the screen asking if there is an SDEC 1000/2500 in this system. The computer will pause at this point, waiting for your response. DO NOT respond at this time.

R a i s e t h e v o l u m e o f t h e P r o c e s s o r , l i s t e n i n g a s y o u d o f o r a n y a b n o r m a l n o i s e s . @@@@@@@@@@@@@Th i s i s n o w m i c r o p h o n e # 1 . @@Fig. 14 illustrates proper microphone placement technique. Gridlines have been added for e a s e o f v i s u a l i z a t i o n . @@1. 2. 3. 4. 5. @@@@@@N e v e r p l a c e a m i c r o p h o n e w i t h i n 6 " o f a n o t h e r m i c r o p h o n e .
I t i s b e s t i f t h e y a r e s e p a r a t e d b y 1 ' o r m o r e . N e v e r p l a c e a m i c r o p h o n e w i t h i n 6 " o f a w a l l . Figure 15: M icrophone Placement 3 DACS4 SOFTWARE OPERATION D A C S 4 r u n s a u t o m a t i c a l l y w h e n y o u b o o t t h e c o m p u t e r . D A C S 4 r u n s i n W i n d o w s TM 3 . 1 x .
P r i o r t o s t a r t i n g D A C S 4 , p r o g r a m e x e c u t i o n w i l l p a u s e , a s k i n g i f t h e r e i s a n S D E C 1 0 0 0 / 2 5 0 0 i n t h e s y s t e m . P r e s s Y e s . N e x t y o u a r e a s k e d t o i n s e r t t h e b l a n k d i s k p r o v i d e d w i t h t h e S D E C i n t o t h e d r i v e " A " . D o s o n o w a n d p r e s s R . Th e c o m p u t e r w i l l l o a d a l l n e c e s s a r y s o f t w a r e o n the disk to create a "LOADER" utility disk. Leave the disk in Drive A: throughout the calibration session. Figure 16: DACS Open ing Screen Th i s i s t h e f i r s t s c r e e n d i s p l a y e d b y t h e D A C S S y s t e m . Yo u h a v e t h r e e p o s s i b l e c o u r s e s o f action. 1. 2.

3. R u n D A C S 2 . A n a l o g e q u a l i z e r e q u i p p e d s y s t e m s . Run DACS4. SDEC equipped systems. S h u t d o w n . R e t u r n t o D O S . H i g h l i g h t t h e [S D E C] b u t t o n a n d d o u b l e c l i c k . Th i s w i l l s t a r t D A C S 4 . 3 Customer Information Window Figure 17: Cust omer Informat ion Window Th e i n f o r m a t i o n y o u p r o v i d e h e r e p e r f o r m s t w o i m p o r t a n t f u n c t i o n s .
I t a t t a c h e s a C u s t o m e r a n d D e a l e r n a m e t o t h e t e s t d a t a t h a t i s s a v e d b y D A C S 4 . Th i s d a t a i s l a t e r u s e d t o c r e a t e t h e Synthesis Calibration Certificate. Please take care to enter the customer's name exactly as he p r e f e r s a s t h i s i s w h a t w i l l b e p r i n t e d o n t h e c e r t i f i c a t e . U s e t h e T k e y t o a d v a n c e f r o m o n e f i e l d t o t h e n e x t . I f y o u w i s h t o r e t u r n t o a p r e v i o u s f i e l d , p r e s s A + T . F o r m e n u s e l e c t i o n s , c l i c k o n t h e b b u t t o n t o e x p a n d t h e m e n u . Yo u m u s t m a k e a s e l e c t i o n i n a l l f i e l d s b e f o r e D A C S 4 w i l l r u n . 3 Select Model Figure 18: Cust omer Informat ion: Select a Synthesis M odel C l i c k o n t h e b b u t t o n t o e x p a n d t h e s e l e c t i o n m e n u . Th e r e a r e t h r e e Mo d e l s o f S y n t h e s i s , b u t several possible permutations. Select Surround Processor Figure 19: Select a Surround Processor C l i c k o n t h e b b u t t o n t o e x p a n d t h e s e l e c t i o n m e n u .
S e l e c t t h e a p p r o p r i a t e P r o c e s s o r m o d e l from the list. Select Screen Compensation F i g u r e 20: Select screen co mp en sat ion If one or more main speakers are behind a perforated screen or decorative cloth, add screen c o m p e n s a t i o n t o t h e S D E C . C l i c k o n t h e b b u t t o n t o e x p a n d t h e s e l e c t i o n m e n u . S e l e c t t h e appropriate screen, cloth or None. A f t e r y o u h a v e e n t e r e d t h e r e q u i r e d i n f o r m a t i o n y o u m a y p r e s s R o r m o u s e c l i c k o n t h e [O K] b u t t o n t o a d v a n c e t o t h e n e x t s c r e e n . 3 DACS4 Connection Confirmation Screen Figure 21: DACS4 On Screen Wiring Diag ram B e f o r e D A C S 4 r u n s , t h i s h o o k u p d i a g r a m i s p r o v i d e d f o r y o u r r e v i e w . P r e s s R t o c o n t i n u e . 3 DACS4 Main Screen Communication Fields Th e f o l l o w i n g i s a n o v e r v i e w o f t h e f e a t u r e s a n d c o n t r o l f a c i l i t i e s a v a i l a b l e . F i g u r e 22: DACS4 M ain Screen Th i s i s t h e m a i n S y n t h e s i s c a l i b r a t i o n w o r k s p a c e . B e f o r e y o u b e g i n c a l i b r a t i o n , t a k e a f e w m i n u t e s t o f a m i l i a r i z e y o u r s e l f w i t h t h e s e v e n d i f f e r e n t c o m m u n i c a t i o n f i e l d s r e p r e s e n t e d o n this screen.

3 Response Graph Figure 23: Response Graph Window Th i s a r e a o f t h e s c r e e n d i s p l a y s t e s t r e s u l t s , o v e r l a i d o n t h e t a r g e t c u r v e . @@@@@@@@Each bar graph gives an indication of relative boost or c u t . @@@@@@@@@@@@@@A l t e r n a t e l y , y o u c a n e n t e r a n y d e s i r e d l e v e l o f b o o s t o r c u t (w i t h i n t h e a l l o w a b l e r a n g e) d i r e c t l y i n t h e " d B " b o x . P r e s s i n g C + Q Q Q t o g g l e s t h r o u g h a l l a v a i l a b l e f i l t e r b a n d w i d t h s . Channel and Mode Selection/Status Figure 26: Direct Channel and M ode Access Th e s t a t u s o f a l l c h a n n e l s i s i n d i c a t e d h e r e . E a c h c h a n n e l i s d e s i g n a t e d a s f o l l o w s : S = s u b w o o f e r ; L , C , R = l e f t , c e n t e r a n d r i g h t r e s p e c t i v e l y ; A L . A R = s u r r o u n d , l e f t a n d r i g h t . Th e active channel is indicated by a black dot the diamond above each channel designator. C o m p l e t e d c h a n n e l s a r e i n d i c a t e d b y a b l a c k c h e c k m a r k a b o v e e a c h c h a n n e l . Yo u c a n jump directly to any channel and begin a test by clicking the mouse pointer on the diamond of t h e c h a n n e l yo u w a n t t o t e s t n e x t .
Th e a c t i v e m o d e (Mu s i c o r C i n e m a) i s i n d i c a t e d b y t h e s o l i d b l a c k t e x t a n d a b l a c k d o t t o i t s l e f t . C o n v e r s e l y , t h e i n a c t i v e m o d e i s s h a d o w e d . D e p e n d i n g o n t h e c o n d i t i o n s u n d e r w h i c h y o u a r e t e s t i n g , y o u m a y a l s o s w i t c h b e t w e e n Mu s i c a n d C i n e m a m o d e s b y c l i c k i n g t h e r a d i o button to the left of each mode. 3 Previously Tested Channel Overlay Control Figure 27: Channel Display Contro l Field A f t e r t e s t i n g a n y c h a n n e l , t h e c o r r e s p o n d i n g t e x t i n t h i s c o m m u n i c a t i o n f i e l d t u r n s s o l i d b l a c k , i n d i c a t i n g t h a t i t i s a v a i l a b l e f o r d i s p l a y . A n y c h a n n e l p r e v i o u s l y t e s t e d c a n b e o v e r l a i d o n t h e c u r r e n t r e s p o n s e g r a p h .
To d i s p l a y a t e s t e d c h a n n e l , c l i c k t h e m o u s e p o i n t e r o n t h e b o x t o t h e l e f t o f a n y a v a i l a b l e c h a n n e l . A c h e c k m a r k w i l l b e p l a c e d i n t h e b o x , i n d i c a t i n g t h a t t h i s c h a n n e l i s b e i n g d i s p l a y e d .

Available channels can also be displayed by pressing the letter key corresponding to the underlined letter in each available channel. Online Help Figure 28: Continuously Updated Online Help Topical information is continuously presented here. The full text of each topic frequently exceeds the size of the window.
Use and dd to scroll. When you move to the next step, this field is updated. 3 Function Keys Figure 29: Function Keys DACS4 uses eight function keys. You may either press the function key (on the keyboard) or click on them with the mouse pointer. 1 HELP: This is a compilation of help topics. 2 AUTO EQ: Initiates automatic EQ of the active channel. 3 ACCEPT: Press when you have completed all adjustments on the active channel. 4 TEST: Runs a test of the active channel. S+4: Test active channel with display smoothing. 6 EXIT: Program Quit.

7 Room EQ: Enables additional bands of EQ. Read the information presented in the online help window. 8 GAIN/DELAY: Displays channel gains and microphone-to-speaker distances. Pressing 8 again clears this dialog box. Channel Gain & Delay Figure 30: Channel Gain and Delay Dialog Box System Status Figure 31: Syst em St at us Delay During software execution, information about data transfer to/from the SDEC and other system feedback are presented here. 3 STEP-BY-STEP CALIBRATION Figure 32: Fresh Install, First Screen Start by reading the information presented in the online help field. It will guide you through the entire calibration process. When you have finished, press the s to continue. You will not be able to proceed until the s is pressed. Although it is possible to test channels in any order, DACS4 always starts with the subwoofers.
Auto-Time Correction The first test you will perform, Auto-Time Correction, will briefly stimulate each speaker to determine the distance from microphone #1 to each speaker. Press C+T to run the test. After the test, a dialog box will appear which reports the measurement results. Figure 33: Auto- Time Correction Dialog Box Gain and distance information for all channels is displayed. The channels are listed on the left.
The three numerical columns display, from left to right, CINEMA mode levels, Distance to MIC #1 and MUSIC mode levels. 3 Occasionally, the displayed distance may be incorrect. Take a moment to confirm that the measurements are correct. A normal tolerance for these measurements is ±6". If one or more channels are incorrect, press 8 to clear the dialog box and repeat the test.
The most likely cause of error is excessive noise. Minimize extraneous noise during the test. If you still get an error, highlight the channel and enter the correct measurement manually. DO NOT make any gain changes at this time. The gain settings may be adjusted later. When you are finished, press 8 to store the indicated settings and close the dialog box.
Subwoofer Calibration Before attempting equalization of any speaker, you must have the level set correctly. Figure 34: DACS4 read y for subw oofer lev el test 3 Run a Level Test The goal is to set the subwoofer level such that the un-equalized response fits over the target curve as well as possible. Press 4 to run a test of the un-calibrated speaker. The sound level may be several dB high or low and the response may be very irregular.

This extreme irregularity can make it difficult to determine how much the level needs to be shifted. If you cannot interpret the level, press S+4 to repeat the test using a smoothing algorithm. Figure 35: Left: Pre- EQ response. Right: Pre- EQ w ith disp lay smoothing On the right, the light upper trace is the first test, with smoothing, the heavy lower trace is the second test, after lowering the subwoofer level 5 dB. To the left is the same test conducted using only 4, which performs a standard resolution test. You may repeat S + 4 and/or 4 as often as necessary to produce the desired result. Run Auto-EQ When you have performed the tests and adjustments described above, you are ready to initiate the Auto-EQ routine. Press 2 now. Figure 36: Response after Au to-EQ The graph above illustrates the results of Auto-EQ. This is typical.
If you wish to attempt manual EQ you may do so now. When you are satisfied with the results, press 3. This transmits the final settings for this channel to the SDEC, places a checkmark in the diamond above the sub-woofer channel status indicator and advances to the Left Cinema channel, ready for additional tests. 3 Left-Center-Right Calibration The procedure in the "Subwoofer Calibration" above is substantially repeated for all subsequent channels. The topics that follow will focus on the differences.
Steps that have already been explained will be listed only. Set the Level S+4 (smoothed) or 4 (normal): Adjust level, repeat as needed. When setting the level, focus your attention above 1 kHz. Figure 37: Left Cinema Lev el Set Auto-EQ Press 2 to perform Auto-EQ.

Auto-EQ only works below 800Hz.
Beyond correctly setting the level, you should make no attempt to equalize above 800Hz. Figure 38: Auto EQ [F3]: Accepts settings. In the example above, the blue trace is the un-equalized response. 3 Surround Calibration The calibration procedure for the surround speakers is slightly different from the main speakers. Set The Level It is not necessary to use C + 4 when testing for correct level of Surround speakers. Use 4 to check for and adjust the level. Repeat as needed. The range of equalization for Surround speakers is 100Hz to 5kHz. When setting the level, it is best to match the level over the entire range of the target Figure 39: Typical Surround Target Auto-EQ Press 2 to initiate auto-EQ. Press 4 to run a response test.

Press 3 when you are satisfied with the results. When calibrating a Cinema only system, accepting the last Surround channel signals the end of the calibration sequence. DACS4 will begin the "job completion" procedures. Skip forward to "Quitting DACS4". Cinema + Music systems will now switch over to Music mode calibration. Music Mode Calibration When you accept the last channel in Cinema mode, DACS4 re-configures itself for calibration of the Music mode speakers. DACS4 will request mode changes of the Surround Processor during the transition. Follow the instructions presented on the screen. You will calibrate the left and right main speakers. The subwoofers will be re-calibrated to match the music mode speakers.
The procedures are the same as for Cinema mode. When you have accepted (3) all music mode channels, DACS4 will begin "job completion" procedures. 3 Quitting DACS4 When you have accepted all channels, DACS4 will transmit and burn (into memory) all settings to the SDEC. Follow the instructions presented and the program will terminate.
Remove the "Loader" utility disk from the computer and store it in a safe location at the and humidity apply to installation site.
All the usual admonitions about dust, heat the choice of storage location. Test Channel-to-Channel Balance After completing calibration, check the channel-to-channel balance using the SLM provided. 1. 2. 3.
Set the surround processor to internal noise generator. Set the SLM to the 70dB range, "A" weighted, slow response. See "USING THE SOUND LEVEL METER" Section 3, pg. 22-23. Stop the noise circulation on each channel (except subwoofers) long enough to get a stable level reading. Adjust as needed to balance all channels to read 75dBA. IMPORTANT! Do not use the SLM to measure and adjust the subwoofer level. SLM measurements of subwoofers are notoriously unreliable. See #4 below. 4.

Take the average change applied to the left and right mains and apply this same gain change to the subwoofer level. EXAMPLE 1: You have raised the left channel 2dB and right channel 3dB. The average level change is +2.5dB. Raise the SUBWOOFER OUTPUT LEVEL 2.5dB. EXAMPLE 2: You have raised the left channel 2dB and lowered the right channel 2dB. The average level change is 0.0dB. Do not change the subwoofer level.
Why Use the SLM? DACS4 is a high resolution spectrum analyzer. This means that it measures and displays the entire audio spectrum, and it does so with five microphones distributed throughout the listening area. This is a very accurate objective measurement system which bears little resemblance to a sound level meter, or to the needs of level balancing a system. The internal noise generator is spectrally limited to a frequency range which the human ear is most sensitive to. It is our subjective sensitivity to level in this range that makes it the preferred method of level balancing.
3 Quitting Before All Channels Are Accepted You can quit DACS4 at any time by pressing 6. You will be given two warnings that quitting early returns the SDEC to the un-calibrated state. Follow the instructions on the screen to quit the program. Figure 40: Early Quit Warnings Quitting before all channels have been calibrated will return the SDEC to an uncalibrated state. You will lose all settings you have completed.
3 SECTION 5 - SDEC 1000/2500 INTRODUCTION Operation of the SDEC 1000/2500 is transparent to the end user. Nearly all SDEC calibration control is performed through a computer interface. Once set, the non-volatile memory ensures the settings made will remain. Two mode switches are located on the rear panel. One selects Cinema only or Cinema/Music operation while the other selects between auto or manual power. The only internal adjustments are output stage gain and input stage attenuation. The proper use of these switches is addressed in this section. SDEC Equalizers manufactured with serial number prefix TN0001-xxxx do not have gain and attenuation switches. Call your Synthesis representative if gain or sensitivity is required. All other SDEC's have internal, dual in line package (DIP) switch selectable input attenuation and output gain, allowing the SDEC to be adapted to nearly any environment.