LynTec

PROFESSIONAL AUDIO EQUIPMENT

PAC+
PROGRAMMABLE AUDIO CONTROLLER

INSTRUCTION MANUAL

LynTec

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INSTRUCTION MANUAL

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LynTec PAC Plus

MULTI-CHANNEL, MULTI-TIMED, PROGRAMMABLE AUDIO CONTROLLER

for timed level control of MASKING NOISE, PAGING and MUSIC

Benefits of time/level controlled masking

Adapts to speech privacy requirements, reducing masking noise level at nights and weekends when office population is low. Masking may also be reduced during lunch hour.

Off-hours security is improved when masking is reduced.

Unusual noises become more obvious.

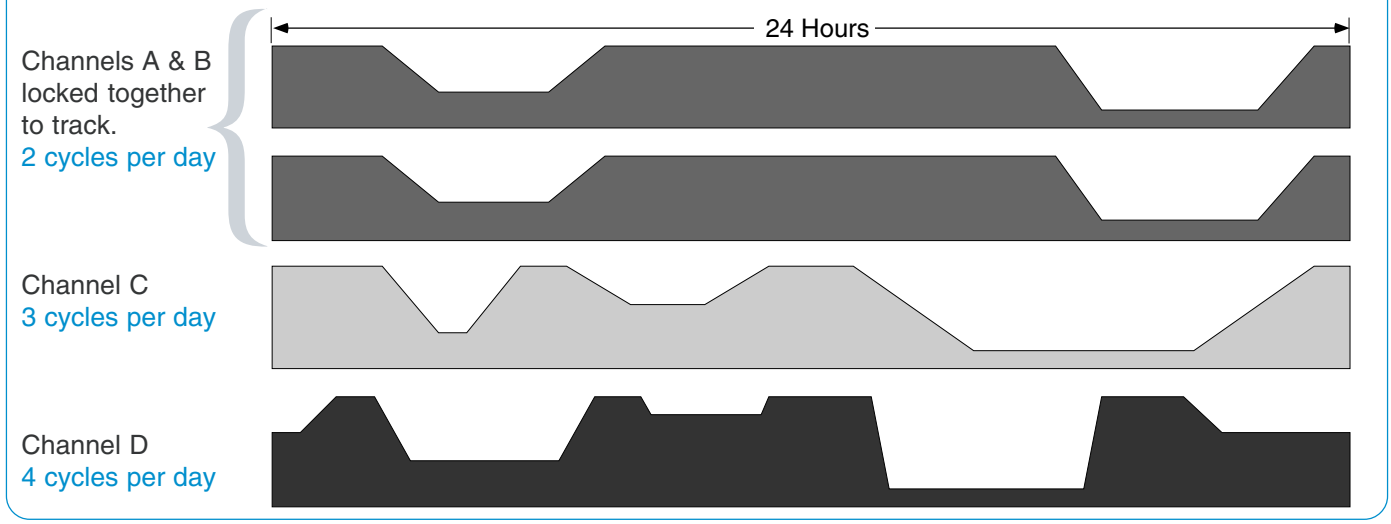
Benefits of timed music level control

Reduces music levels during off-hours, providing a more adaptive environment.

Provides a control mechanism to conform to urban noise codes for outdoor background music.

PAC+ Features

- Timed level control of up to 6 channels of *any* program material.
- Up to 4 timed level cycles per channel per day.
- Individual day control for all days, normally used for weekends.
- Fully *FIELD PROGRAMMABLE* from the front panel.
- Attenuation programmable from 0 to 24 dB in 1.5 dB steps
- Level changes are made in 3/8 dB steps for super-smooth transitions.
- Channels may be locked together to assure tracking or programmed separately for different time programs.
- Automatic programming lock prevents program tampering, no security covers are needed.
- Built-in pink noise generators optional, 1 to 6 channels of non-coherent pink noise. Two channel masking systems are typical.
- **SLO-START** is standard. Automatic slow first-time turn-up of masking noise without costly return trips. Reduces the psychological impact of adding masking noise to occupied space.
- Clock and field programmed time and level entries are totally non-volatile with over 10 years of operation in the absence of power. Clock and RAM assembly is plug-in replaceable.
- Automatic daylight saving time and leap year adjustment. Shipments after 8/05 conform to old (thru 2006) and new (2007) DST protocols.
- At power-up the PAC+ *soft starts,* eliminating instantaneous high level noise when AC returns after a power failure.
- Full input and output transformer isolation for high common mode hum rejection: 5KΩ bridging inputs, 600Ω outputs.
- Stable proven design.
- All solid state, no relays.
- UL & CSA listed power supply attached to reduce rack clutter.



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Techno Politics of Sound Masking

by Lynn Potter

Open-plan offices offer flexibility at reasonable cost. The furniture, low partitions and carpeting found in open-plan offices are designed to absorb noise. The air conditioning system is also designed to minimize offensive noise.

Why it's done

A quiet office is a productive atmosphere *until it is populated with people!* Speech privacy then becomes an unsolved opportunity that may be addressed with sound masking.

Sound masking refers to the addition of electronically generated and spectrally shaped noise (not too hissy or rumbly, NC38-NC40) to reduce the intelligibility of speech.

How it's done

The most basic sound masking system consists of an electronic noise generator, an equalizer to shape the frequency spectrum of the noise, and power amplifiers feeding loudspeakers hidden above a lay-in ceiling.

The politics of sound masking

Sound masking must be unobtrusive to the people occupying the space. Masking noise is subjective. The shaped pink noise used in sound masking sounds much like air conditioning noise. To the occupants it should seem as natural as the air conditioning noise in their car.

Many people harbor a basic resentment to being managed. The addition of *artificial noise* in the workplace to improve speech privacy and productivity may appear manipulative.

Easy does it with time control

Successful sound masking must be brought into the workplace *very tactfully* and controlled carefully.

The masking level should be lower at night when the work force is small.

Speech privacy is usually less important than a quieter workplace for the off-peak-hours workers.

It is especially unnerving to return to a fully sound-masked office from a deserted street.

"There's nobody here...why is it so noisy?"

Better security

Timed level control of masking noise is also important to security personnel.

Off-hours masking should be lower for better detection of unusual security related sounds.

Introducing sound masking into the workplace

A new facility is the easiest. When people move into new surroundings they expect some adjustment to their new environment. If the air-conditioning noise seems higher than in the unmasked office they moved from, they'll probably get used to it.

Installing masking in occupied space is a bigger challenge. The installation of loudspeakers and the equalization should be done in off-hours to prevent disruption of activities... "Whatcha doin'?" "Uh..., we're puttin' in noise to cover up your gabbin'."[wrong!]

The initial turn-on is best done at a low level with upward adjustments over a period of days to minimize the psychological impact of adding noise to the space.

LynTec's **SLO**-START does this automatically without midnight technician trips.

Low Cost vs. Low Success

Several technical elements separate low cost masking that may be unsuccessful from a first class masking system that the occupants and management will be pleased with. Proper spectral shaping and consistent level of noise is important to prevent hot or weak spots where the noise is noticeably different, drawing attention to it.

Level Consistency Important

Level consistency is important for the masking system to be innocuous. The less change heard the better. Loudspeaker coverage is one of the favorite cost-cutting targets in lo-ball masking systems.

Skimping on loudspeaker quantities allows skimping on power amplifiers. This double barreled cost savings usually results in poor masking coverage with obvious variations in noise as you walk through the office or down a hallway. This level scalloping is a dead giveaway that there is something more than air-conditioning noise up there.

Another cost-cutting approach is to mask only the areas that are causing problems now by pinpointing loudspeaker coverage. When the office is rearranged, this inconsistent technique backfires.

Complete, consistent masking coverage helps deliver the flexibility implied by an open-plan office.

Two-channel masking systems

If we believe consistency is desirable, then two channel masking is divine. Two channel masking costs little more in large systems than a single channel. Two channels offer two big advantages, redundancy and no phase coherence.

Redundancy

Two redundant channels feeding crisscross connected loudspeakers provide a no-sweat masking system should one channel fail. It is not unusual for people to start complaining about the room temperature when a single channel masking system quits, since they think the air-conditioning has failed.

Non-phase-coherent sources

When two non-phase-coherent (separate) noise sources are used, the result is a more open and airy feeling in the sound masked space.

When two sources are used, the instantaneous output of each channel has no phase relationship to the other channel. At any point in time, one loudspeaker diaphragm may be pulling while the adjacent diaphragm is pushing. In the next instant it may be push/push or pull/pull, but they are never in sync for any length of time. (sorta like Congress)

This non-coherence creates an open feeling because you can't localize the source of the noise.

If you can't localize the source or hear level variations in the noise, it must be an integral part of the building... probably just the air-conditioning.

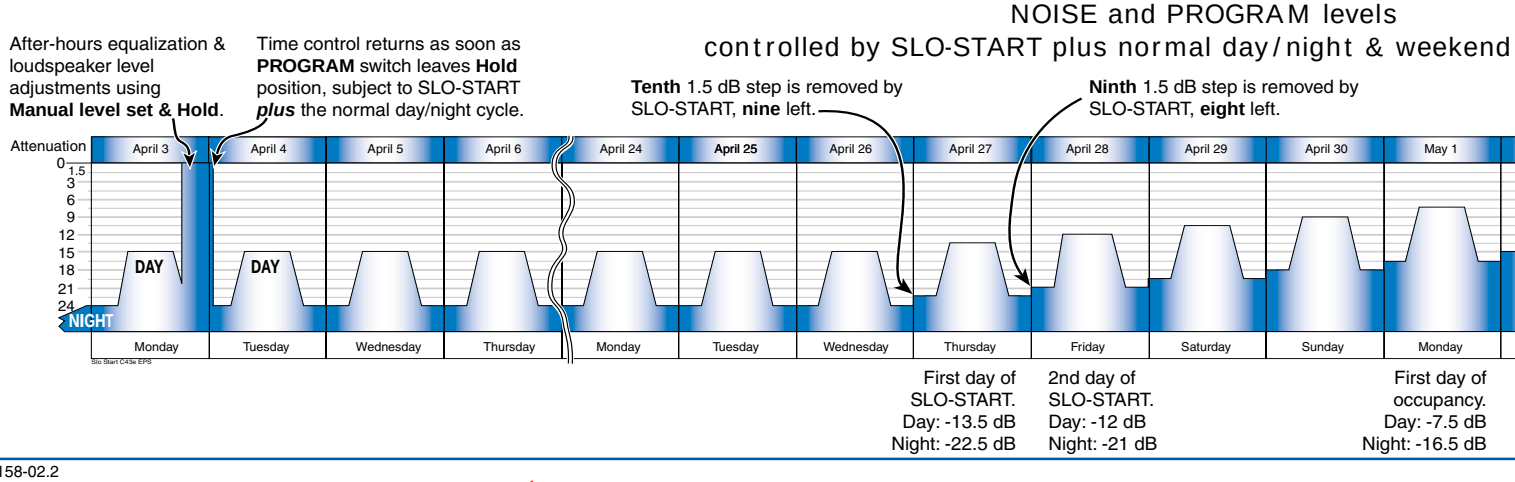
Sound masking is like a toupee: It's a cover-up, but if anyone notices, it's not well done.

If masking goes unnoticed with adequate speech privacy, you've done your job well.

For more information on masking system design and final equalization curves ask for application note:

MASKING NOISE SYSTEMS
A DISCUSSION OF THE FUNDAMENTALS

available from LynTec or as a PDF file at
www.LynTec.com



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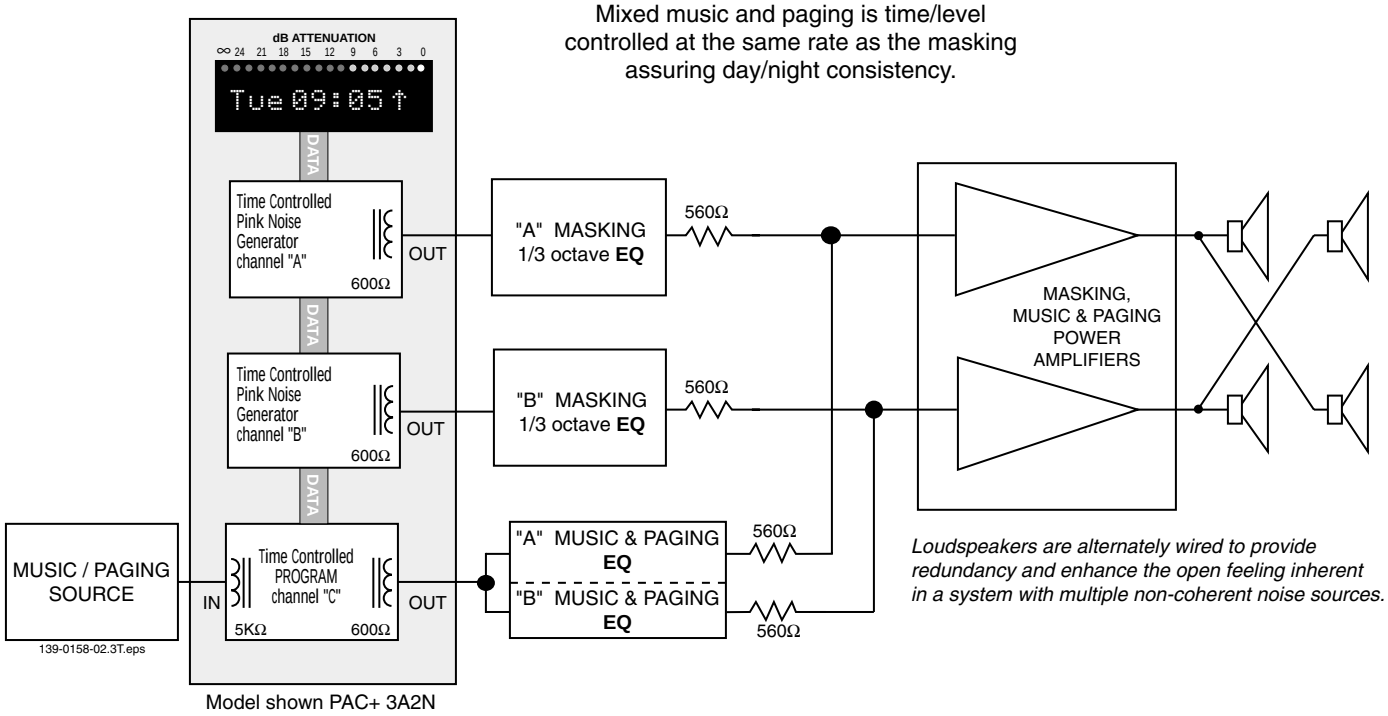
Typical 2 channel Masking System

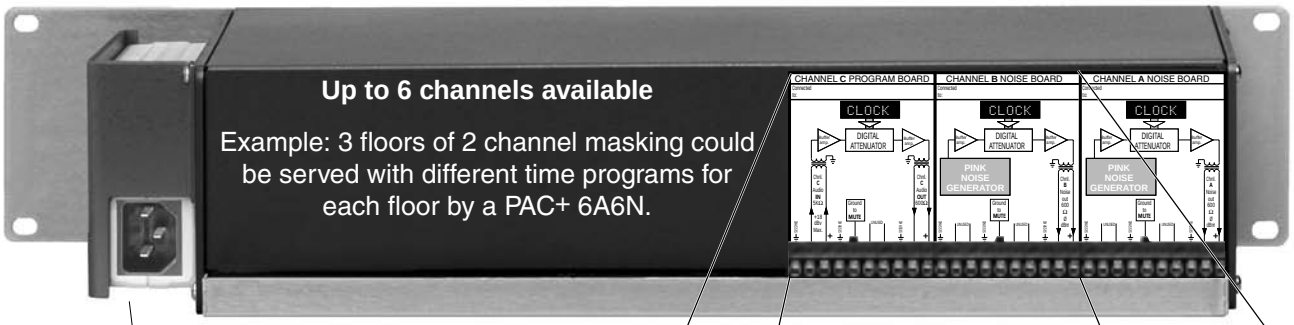
Mixed music and paging is time/level controlled at the same rate as the masking assuring day/night consistency.



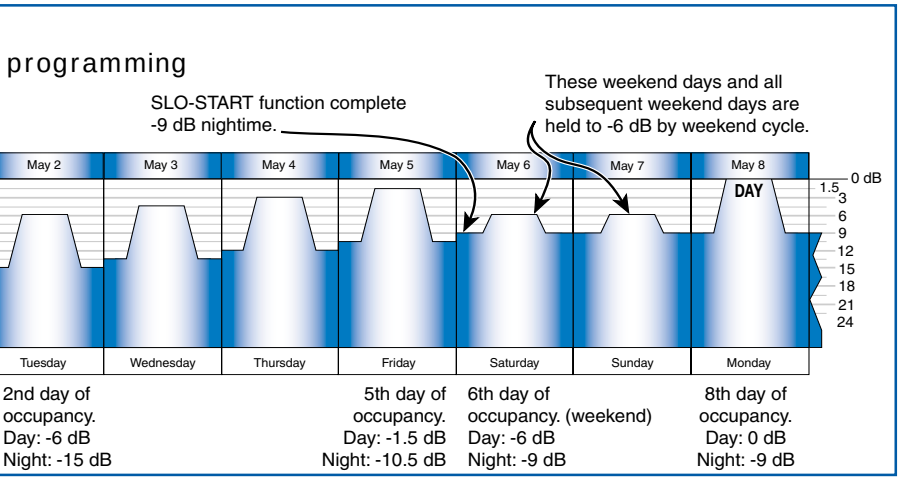
Model shown PAC+ 3A2N

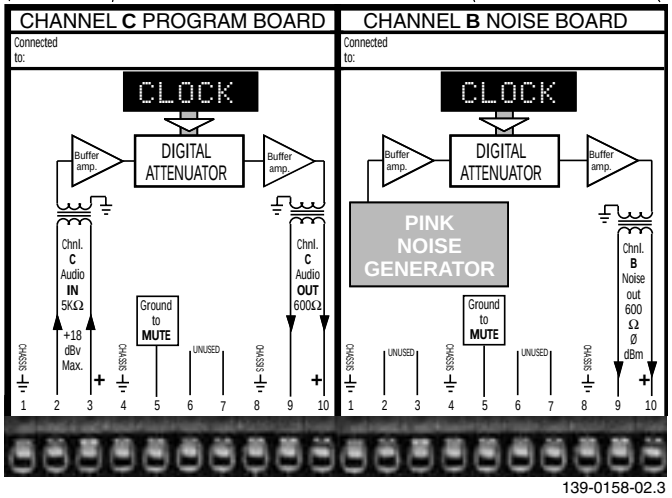
Loudspeakers are alternately wired to provide redundancy and enhance the open feeling inherent in a system with multiple non-coherent noise sources.

REAR VIEW OF PAC+ 3A2N



UL/CSA listed power supply. Attached and out of the way... reduces rack clutter.





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AUDIO PATH PERFORMANCE

Maximum input level:	6.16 volts RMS sine wave, 20 Hz - 20 kHz. [+18 dBm, 600Ω = output clip point]
Program channel audio input impedance:	5KΩ balanced. (bridging transformer) If noise sources are specified, the inputs are internally connected to noise sources without input bridging transformers.
Maximum output level:	+18 dBm (6.16 volts RMS sine wave, 20 Hz-20 kHz.) [clip point]
Audio output (all channels):	Transformer isolated output to feed 600Ω line. (Typical output impedance is ≈275Ω at 1 kHz.)
Normal operating levels:	
Noise channels:	0 dBm RMS (0.775 volts RMS) [18 dB headroom]
Program channels:	-6 dBm (0.389 volts RMS) [24 dB headroom]
Frequency response (program channels):	±1 dB, 20 Hz - 20 kHz, 0 dBm.
Residual hum & noise:	75 dB or more below maximum output. (20 Hz to 20 kHz)
Added distortion:	Less than 0.5% total harmonic distortion added.
Time controlled attenuation:	Programmable from 0 to 24 dB in 1.5 dB steps.
Transition time:	Time required to make a full programmed level change: Adjustable from 1 to 60 minutes. Default: 30 minutes Field adjustment options: 1, 2, 5, 10, 15, 20, 30, 45, 60 minutes, accessible in Set ATTENUATION position.
Attenuation at 0 step [daytime] (program channels):	0 dB within ±0.1 dB, loaded with 600Ω. (unity voltage gain)
Attenuation accuracy:	±0.17 dB of step setting. 0 to 24 dB
Channel to channel attenuator tracking accuracy:	Within ±0.2 dB. (for stereo applications)
Channel to channel crosstalk rejection:	More than 80 dB.

MUTE: Each channel is provided with a MUTE terminal. An external contact closure will light the red MUTE LED on the rear and will instantaneously mute that channel's audio.

The MUTE terminal supplies +10v @10 ma. A remote indicator LED may be used in series. (Do NOT use a series resistor) Any number of MUTE lines may be paralleled... each one will source 10 ma.

MUTE may be used in masking systems to mute the masking noise in an emergency, reducing the audio power required for emergency paging.

OPTIONAL NOISE GENERATORS

Noise generator/s:	Non-coherent pink noise generator/s are optional, located on attenuator boards. The noise is produced by digital simulation with sequence limiting to reduce 'thumping'. The typical cycle time is one minute.
Noise generator output level: (Daytime level)	0 dBm RMS into 600 ohm load. Flat within ±2 dB from 63 Hz to 16 kHz. (As measured with a constant percentage bandwidth analyzer)

CLOCK & DISPLAY

Controller clock: Quartz crystal controlled plug-in clock module. Field replaceable.

Expected life: 10 years of un-powered operation.

Battery backup: Lithium battery built-in to plug-in clock module.

Clock functions: Automatic leap year. 24 hour time displayed on a low voltage fluorescent, auto-dimmed display.

Daylight Saving Time: (All units shipped after 8/05 adapted to old & new DST)
Automatic daylight saving time advances an hour at 02:00 the first Sunday of April and retards an hour at 02:00 on the last Sunday of October through 2006. Beginning in 2007, automatic daylight saving time advances an hour at 02:00 the second Sunday of March and retards an hour at 02:00 on the First Sunday of November.
The auto-DST function may be easily disabled for locations not using Daylight Saving Time. When you set the DATE, answer the dialog `Dlt Svng? Yes or No`.

Clock accuracy: ±1 minute per month. Resolution: 1 minute.

dB ATTENUATION LEDs

The brightest LED shows the *present* attenuation. The other dimmed LEDs show the *range* of attenuation for the cycle and channel selected.

PROGRAMMABLE FUNCTIONS

Each channel may be field programmed for up to 4 level cycles per day. A different cycle set may be programmed for each day of the week.

CONTROLS Front panel:

CHANNEL switch:	Selects the channel that is being viewed on the display.
PROGRAM switch:	Selects programmable functions. The active programmable field brightens.
	Cycle number / Review: Provides a method to review each cycle's end times, attenuation and transition time.
INCREMENT DISPLAY: ↑	Advances active field.
DECREMENT DISPLAY: ↓	Decrements active field.
SHIFT RIGHT & DONE: →	Shifts active field to the right one character. An additional keystroke when the right-most field is bright enters the information (**DONE**). Entry is confirmed as all fields brighten.
Shift left: ←	Shifts active field to left. After **DONE** entry, allows resumption of field editing by *backing into* a single brightened field ready for editing.
LOCK / UNLOCK code: (On rear panel)	System programming is automatically locked out after 4.25 minutes of programming inactivity. The display reverts to current time irrespective of the program switch position and dims to extend display life.

Anyone may determine the program points from the front panel with the **CHANNEL & PROGRAM** switches but all changes are locked out until the **LOCK / UNLOCK** sequence is entered. Unlock code is on back label.

SLO-START

The SLO-START function provides a *slow* automatic turn-up of the masking noise level at initial turn-on. After normal equalization at the daytime level, the Slo-Start *end* date is set to the date you want the system to be at full volume. The Slo-Start end date may be set at any future date. If it is set more than 10 days in the future, 15 dB is added to the normal day/night cycles until Slo-Start begins. The normal day to night ratio is maintained throughout the Slo-Start cycle.

Any combination of channels may be slo-started and the completion time may be different for different channels. Example: Channels A & B Slo-Start beginning July 23, 2007 when floor 2 is scheduled to be occupied and reach full daytime level 10 days later when the Slo-Start *end* date is reached. Channels C & D begin their Slo-Start cycle on January 14, 2008 when floor 3 is scheduled to be occupied, ending 10 days later on the 24th. See Slo-Start graphic on inside pages.

POWER-UP FUNCTION

At initial power-up the PAC+ will start all channels at 24 dB attenuation and increase the level slowly to the programmed level while displaying a `Power Up` message. A scrolling up arrow indicates the level is increasing. This one minute cycle provides a smooth resumption of masking noise after a power failure. Power glitches or power failures less than 4 seconds long are ignored by the Power Up function.

Brownout resistance: Power supply regulator dropout is <85 volts, 60 Hz A.C. Pink noise output level is maintained down to 85 volts.

POWER SUPPLY

100-240vac, 47-63 Hz, 30 watts maximum. (4 watts typical)

Safety ratings: The internally fused switching power supply attached to the side of the **PAC+** is UL, CE, CSA and TUV listed.

FCC DATA

EMI/RFI: The **PAC+** meets the class A EMI/RFI requirements of FCC part 15.

MECHANICAL SPECIFICATIONS

Standard EIA rack mount:	Width: 19.00 inches, Height: 3.5 inches, Depth behind mounting surface: 10 inches max. Extension forward from mounting surface: 0.875 inch max. Weight: 10 pounds max.
Audio connections:	Audio & mute connections are on screw activated terminal strips located on the rear panel.
Power inlet:	IEC 320 receptacle.
Cord supplied:	6 ft., U.S., 3 wire grounded.

ENVIRONMENTAL SPECIFICATIONS

Maximum relative humidity: 95% non-condensing.
Operating temperature: 40° F to 120° F

MODEL NUMBER EXPLANATION

Prefix (all models)	**A**ttenuator Channels	**N**oise Sources
PAC+	3**A**	2**N**

EXAMPLES

A **PAC+ 3A2N** would have **3** total **A**ttenuator channels, one program channel and **2** built-in **N**oise generators and built-in SLO-START.

A **PAC+ 6A** would be fully populated with **6** channels of program type **A**ttenuator boards. Usable for any audio program material, the program boards have 5KΩ bridging input transformers and 600Ω output transformers.

Additional channels (up to 6 total) may be field retrofit.

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CONCEPTS and APPLICATIONS

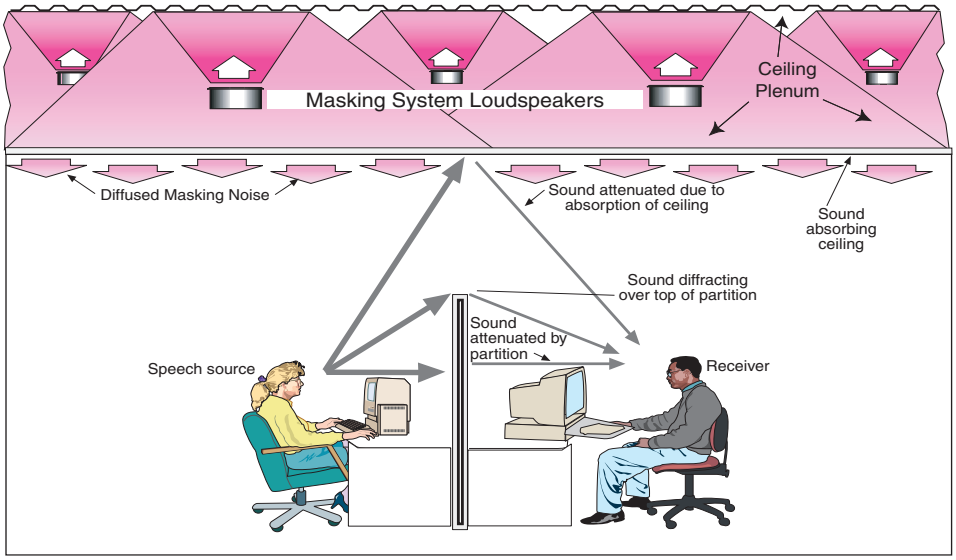
Noise that provides interference with the sounds that we wish to hear is common in our everyday activities. We hop in our automobile, turn on the radio, set the volume control at a comfortable level to receive the news report, and start down the street. Upon entering the interstate highway and increasing our speed, we find that we must increase the radio sound pressure level to produce the same speech intelligibility of the news broadcaster that we experienced at lower speeds. The increased speed has raised the noise level produced by the auto and *masking* of the newscaster's voice has occurred. Now, we decide some fresh air would be nice and we lower the driver's window. The auto interior noise level increases again and we must further increase the radio level to understand the news report... more masking is produced by the auto background (ambient) noise level.

While we may find the masking affect of automobile noise somewhat annoying, the addition of properly adjusted masking noise can create a more desirable environment.

In offices, courtrooms, libraries and other spaces one listener or group of listeners may be disturbed by sound created by another person or group of persons located in the same overall acoustical space. This disturbing sound is often intelligible speech. In such situations the presence of masking noise can be very helpful. Using electroacoustic techniques, it is often necessary to add masking noise to a particular space in order to decrease speech intelligibility between adjacent workstations, offices, etc. This is often the case in open plan offices where the noise reduction that might be provided by traditional walls between offices is not present.

In courtrooms the judge may wish to speak with attorneys without the jury being able to understand the conversation. The background noise level in the jury area may be raised so conversations being held at the judge's bench cannot be understood. This must be a temporary situation, since during most of the courtroom activities, the jury must be able to easily understand speech by the judge, counsel and witnesses.

TYPICAL OPEN PLAN OFFICE WITH MASKING NOISE SYSTEM



In situations where architectural construction provides insufficient noise reduction between adjacent spaces, such as in counseling offices, the introduction of masking noise may be helpful as a substitute for proper architectural noise reduction.

Although it may seem that the introduction of masking noise in any particular space is an easy task, the masking noise system must have certain attributes if it is to provide successful masking and if it is to be accepted by the occupants of the space.

This is particularly true where masking noise is continuous (required at all times).

Depending upon masking noise system design, the masking noise system may also provide background music distribution and/or paging. Separate sound distributions systems for these audio programs are not necessarily required.

This discussion relates primarily to masking noise for open plan offices.

It should be noted, in typical open plan office situations, the introduction of proper masking noise will not normally be the entire solution to speech privacy and annoying sound problems from adjacent work stations. The electroacoustic masking noise system should be one part of a three-part solution to these acoustic problems.

The other two parts of the solution involve the use of effective sound absorbing surfaces, particularly for the ceiling, and the use of partial height partitions (acoustic barriers — higher is better) between workstations.

SUCCESSFUL MASKING NOISE SYSTEM CHARACTERISTICS

An electroacoustic masking noise system for open plan offices should possess the following major characteristics:

- ❑ Masking noise sound pressure level should be sufficient to submerse the sounds that are to be masked, but not so high as to disturb the occupants of the space.
- ❑ The masking noise must contain no information. Thus, music is normally not an effective masking sound. This is also true for mechanical system noise where its presence is often translated by the listener as thermal comfort information.
- ❑ The masking noise must not provide directional cues as to the location of the loudspeakers producing the noise.
- ❑ The spectrum (frequency response) of the masking noise must be established to provide suitable masking while, at the same time, allowing the masking noise levels to be higher than might otherwise be tolerated by occupants without proper spectrum adjustment.

  The spectrum must be *continuous*. That is, there must not be wide level variations between adjacent frequency bands.
- ❑ Masking noise levels must be suitably uniform throughout the architectural space where masking noise is to be introduced. A location-to-location variation not exceeding 3 dB at mid-frequencies is very desirable.
- ❑ In an existing space where masking noise is to be added, occupants of the space must not be forced to accept the addition of masking noise *all at once*. Masking noise levels should be slowly raised over a fairly long period of time (days not hours) until the previously determined maximum levels are established. And, if a masking noise system should fail, the masking noise levels should be reestablished slowly.
- ❑ Where office ambient noise levels (noise levels before adding masking noise) vary with the time-of-day, it is best to employ a masking noise controller which will automatically and slowly lower masking noise levels for periods of time when office ambient noise is low such as is normally the case during evening and night time hours.
- ❑ Sufficient audio power must be provided to establish the desired masking noise levels.

  Several factors must be considered.

  1. The crest factor of the noise program.
  2. The attenuation of the ceiling panels between the loudspeakers and the occupants.
  3. The needs of paging or background music if these programs are to be served by the masking sound system.

See **How much power is needed?** on page 3.

ARCHITECTURAL and MECHANICAL SYSTEM CONSIDERATIONS

Since open plan offices provide the most common use for masking noise systems, the system designer must be aware of the architectural design of the open plan office space.

The illustration on page 1 shows paths for transmission of sound from one workstation to an adjacent station and the introduction of masking noise by loudspeakers located above a suspended sound absorbing ceiling.

Techniques have been established to quantify the noise reduction between workstations as provided by architectural materials and elements. However, the masking system designer and/or installer seldom have much influence on the architectural elements of the space. Proper architectural design will include the following:

- Suspended sound absorbing ceiling using a ceiling tile or board with high coefficients of absorption in the 500, 1000, 2000 and 4000Hz octave frequency bands... Absorption should be 0.85 or greater with NRC (**N**oise **R**eduction **C**oefficient) of 0.90 or higher.

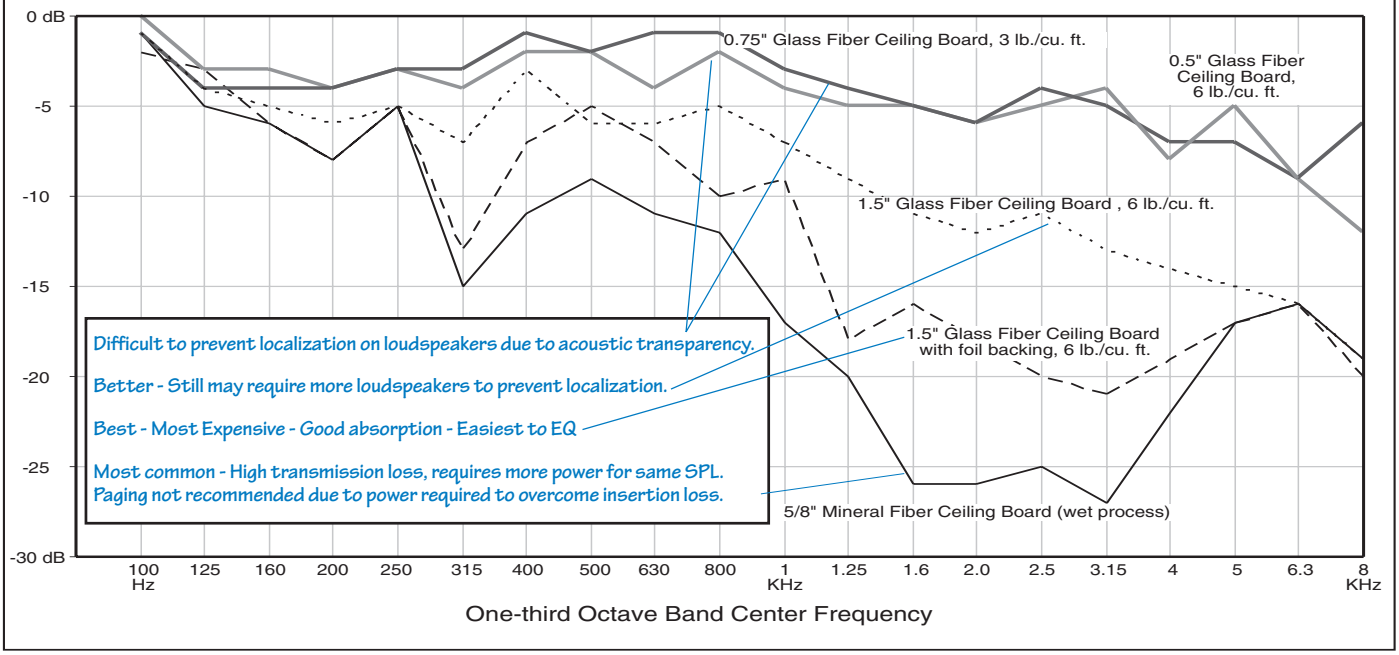
This normally requires the use of glass fiber ceiling board. The most common, wet process mineral fiber ceiling board or tile, typically does not provide the absorption required to adequately control ceiling sound reflections.

The sound absorbing material applied to the deck *above* the drop ceiling also affects the masking noise system. The masking loudspeakers typically face upward, using the ceiling plenum as a noise mixing chamber to diffuse and delocalize the noise sources. The noise is transmitted into the occupied space *through* the drop ceiling material... sort of a leaky box.

Glass fiber ceiling board 1.5 inches thick with cloth facing and with foil backing is the best overall ceiling material to use. Mineral fiber ceiling board provides greater transmission attenuation of the mid and higher frequencies (more of a high pass filter) when compared with glass fiber ceiling board. However, glass fiber ceiling board without foil backing is too transparent acoustically. Thus, localization of the masking noise sources (loudspeakers) is greater.

- Partial height partitions between workspaces with height of *at least* 63 inches... Partition surfaces should be sound absorbing wherever possible; and where such sound absorbing surfaces are used, the partition must include a solid septum to prevent sound from *going directly through* the partition.
- Ceiling plenum with height of 30 inches or more to provide space for masking noise loudspeakers (as well as air handling ducts, sprinkler piping, etc.)
- Carpeted floor... Typical commercial carpet is desirable but not essential.
- The minimum number of lighting fixtures (assuming the use of flush mounted fluorescent luminaires) necessary to provide the illumination required... The horizontal fluorescent light diffusers provide sound reflecting surfaces which allow significant ceiling sound reflection between adjacent work stations, particularly when large size luminaires are used.
- Sound absorbing treatment for fixed wall surfaces when such surfaces provide significant sound reflections between office spaces.

TYPICAL INSERTION LOSS OF CEILING PANELS



HVAC MECHANICAL SYSTEM REQUIREMENTS

Mechanical systems serving spaces in which masking noise is to be introduced can affect masking system performance.

HVAC (**H**eating, **V**entilating and **A**ir **C**onditioning) systems should be designed so that they produce less noise than the electroacoustic masking noise system.

For general office spaces, the mechanical system designer should strive to design a system that produces ambient noise levels described by NC-30 (**N**oise **C**riteria **30**) or lower.

Actual results of NC-35 or RC-35(N) (**R**oom **C**riteria **35** **N**eutral) may prove acceptable, but the designer must have a "safety factor" of about 5 NC points since much of the data used for mechanical system noise control is approximate. However, it is not unusual for the mechanical system to produce low frequency noise in excess of the desirable masking noise levels at lower frequencies. This will affect the field adjustment of the masking system levels and spectrum as discussed on page 4.

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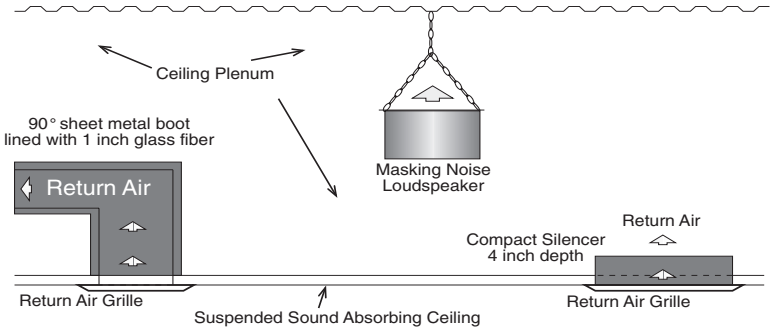
Larger air handling ducts located in the ceiling plenum sometimes cause physical problems in locating masking noise loudspeakers in the plenum space. And, openings in the suspended ceiling for return air often disturb the uniformity of masking noise at the listening level and/or provide a noticeable direction to the masking noise. Conflicts in this regard are normally unavoidable. However, using the following procedures should resolve at least some of the problems.

- Do not attach masking loudspeakers directly to ducts. If a masking loudspeaker must be suspended below a duct, use a trapeze arrangement to suspend the loudspeaker independent from the duct.
- Where a duct and a masking loudspeaker must occupy the same horizontal space, install the loudspeaker with a spacing of at least 24 inches from the side of the duct.
- Do not locate masking loudspeakers above return air grilles. It may be necessary to solve this problem by installing compact silencers or lined sheet metal boots for return air grilles as shown below. Compact silencers with a depth of 4 inches are fabricated by several manufacturers of mechanical system noise control equipment.

PREVENTION OF MASKING NOISE LEAKAGE FROM RETURN AIR GRILLES



DESIGN and FIELD ADJUSTMENT OF MASKING NOISE SYSTEMS

MASKING NOISE SYSTEM DESIGN

The design of a masking noise system is not difficult when compared with the design of most sound reinforcement systems. Many times one design or one overall system will apply to several building areas that have similar acoustical characteristics. Following are some design suggestions that have proven to produce successful masking noise systems in actual applications.

Sound Distribution

- Just as for all sound systems, the sound distribution (loudspeaker) system is of paramount importance. The other portions of the system, noise generators, controller, equalizers, power amplifiers, are certainly important. But, without proper sound distribution the system will not be successful and well received by the occupants of the space.
- Install 8 inch cone type loudspeakers mounted in enclosures and directed up into the ceiling space. In most cases, directing the loudspeakers up will provide the most uniform sound distribution in the occupied space with reasonable loudspeaker spacing.
- Except where plenum space is very limited, where a loudspeaker must be installed beneath an air handling duct, etc., install the masking loudspeakers with a space of at least 12 inches between the bottom of the enclosure and the upper surface of the suspended ceiling.
- Install the masking loudspeakers on about 12 foot centers using a staggered pattern where practical.
- Extend masking noise distribution into conventional offices that open directly into open plan office areas and also extend masking into lobbies and similar spaces that are adjacent to the open plan office areas. For these adjacent offices and lobbies it is a good idea to use masking loudspeaker assemblies that have a switch for 70 volt transformer tap selection. In this way, the masking levels can be reduced by 3 or 6 dB if this produces a more pleasant atmosphere in these areas or if demanded by a particular office occupant.
- As noted under suggestions for masking noise controllers, use two or three pink noise generators to form two or three incoherent noise programs.

How much power is needed?

Assuming the worst case in regard to ceiling sound insertion loss, a ceiling using mineral fiber lay-in board, allow 0.5 watts of audio power per loudspeaker if masking noise only is being distributed.

Actual measurements indicate that a masking noise level of NC-42 can be produced by average power of 25 mW per loudspeaker. However, the crest factor of the noise, typically 12 dB, must be handled without power amplifier output clipping. 12 dB headroom requires that the average power be multiplied by 15.8. The power per loudspeaker is therefore 0.4 watts. Thus, the connection to use on most 70 volt loudspeaker transformers is 0.5 watts. Even if the ceiling board is foil backed glass fiber with lower insertion loss (refer to Figure 2), it is suggested that power of 0.5 watts per loudspeaker be maintained.

If paging is to be distributed along with masking noise, the audio power requirements are significantly increased.

To produce mid-frequency paging sound pressure levels of 60 to 65 dB, an increase of approximately 20 dB or 100 times power over average masking noise power is required. Therefore, average paging power required is about 2.5 watts per loudspeaker. But, headroom of at least 10 dB is required for the paging audio. 25 watts of audio power should therefore be allowed if the ceiling is mineral fiber lay-in board. This amount of audio power per loudspeaker does seem to be impractical.

Of course, the solution to this situation is to use glass fiber ceiling board with foil back which has a mid-to-high frequency insertion loss approximately 10 dB less than exhibited by typical mineral fiber ceiling board.

Therefore, with a foil backed glass fiber board ceiling, power per loudspeaker of 2.5 watts should be just adequate. Good practice is to allow 5 watts per loudspeaker when both masking noise and paging are to be distributed. For paging programs it is assumed that adjustable compression or limiting is provided.

Power Amplifiers

- Please see the comments above about audio power requirements.
- Power amplifiers with detented gain controls in 1 or 2 dB steps are recommended.

Accurate level changes can then be easily made and previous levels can be accurately restored.

- Of course, most masking systems will use 70.7 volt distribution.

Equalizers

- One-third octave band equalization is recommended for curve adjustment ease.
- For systems where cost is a major issue, full octave band equalization may be satisfactory.
- Parametric equalization may also be used, but it is more difficult to adjust and make subtle changes.
- A separate equalizer channel is required for each noise program channel.
- Separate equalization is required for the paging and/or background music channel.
- Each major office area that has significantly different acoustical characteristics due to different ceiling material, major differences in ceiling plenum space, or major differences in open plan furniture and furniture arrangements will need a separate set of equalizers.

Masking Noise Controller Noise Generators

- As previously mentioned, employ at least two noise generators to form two or more incoherent noise programs.
- Use a controller that provides *time-of-day level control* so that masking levels can be

unobtrusively changed with major changes in office occupancy and the resulting changes in office ambient noise (not including masking noise). Time-of-day level control is normally used to slowly reduce masking noise by about 9 dB over a 30 minute or 1 hour period beginning at the end of the normal workday. The daytime level is then restored over the same time period so that daytime levels are present at or near the beginning of the normal workday.

- Employ a controller that provides slow restoration of masking noise levels over a several minute period after an electrical power failure.
- Use a controller that provides very slow *start-up* of a masking noise system that has been added to an existing office space. The final acoustic levels should be reached over a period of several days. This technique will avoid some comments by office occupants that the noise is too loud or disturbing.

FINAL ADJUSTMENT OF MASKING NOISE SYSTEMS

Four basic tasks must be accomplished during masking system test and adjustment.

1. All audio equipment including each loudspeaker must be checked for proper operation. This includes making sure that loudspeaker transformers are properly connected (an impedance meter or impedance bridge will help with this task) and that, with "flat" equalization, the spectrum of the noise appearing at the output of each power amplifier is "flat" unmodified pink noise (a real time spectrum analyzer used as a voltmeter will assist with this task).

2. The masking system controller must be adjusted in regard to time-of-day attenuation, slow start-up and other features that may be provided by the particular controller being used.

3. The acoustic response of the system must be adjusted by using the one-third octave band equalizers. System response is most easily measured in one-third octave bands by a real time spectrum analyzer.

Either a dedicated hardware spectrum analyzer or an FFT based software analyzer and computer may be used.

If a computer is employed it is essential that the sound card have a flat frequency response over the frequency range of about 63 Hz to 8000 Hz

The microphone used should be omnidirectional and flat over the same frequency range.

The measured response should be *averaged* over at least three typical locations in the office space.

The target curve below illustrates a spectrum that will provide good results in most applications. This spectrum should be considered as a starting place. It may be necessary to modify it somewhat to achieve the desired masking for the particular application. Please note that the target spectrum is defined by measurements in one-third octave bands.

The masking system spectrum is typically adjusted by observing one-third octave frequency band sound pressure levels. This may be most easily accomplished by initially setting the levels somewhat higher than indicated by the target curve chart, perhaps 6 dB higher in each one-third octave band.

If your test equipment does not provide for making *calibrated* SPL measurements in third octave bands, select levels that are *above* ambient noise by at least 8 to 10 dB in each band.

4. After the curve *shape* is achieved by adjusting the system equalizers, the proper system *levels* can be set by using the detented power amplifier gain controls.

If your equipment only measures SPL's in octave bands or is only calibrated for A scale, the levels will be different from the third octave levels. The shape of the desired curve, of course, will be the same. Adjust the sound pressure level in the 500 Hz octave band within the range of 49 dBA for the upper limit or 43 dBA for the lower limit.

It may be possible to raise system levels by 2 or 3 dB above the upper target levels indicated, but some complaints from office occupants can be anticipated.

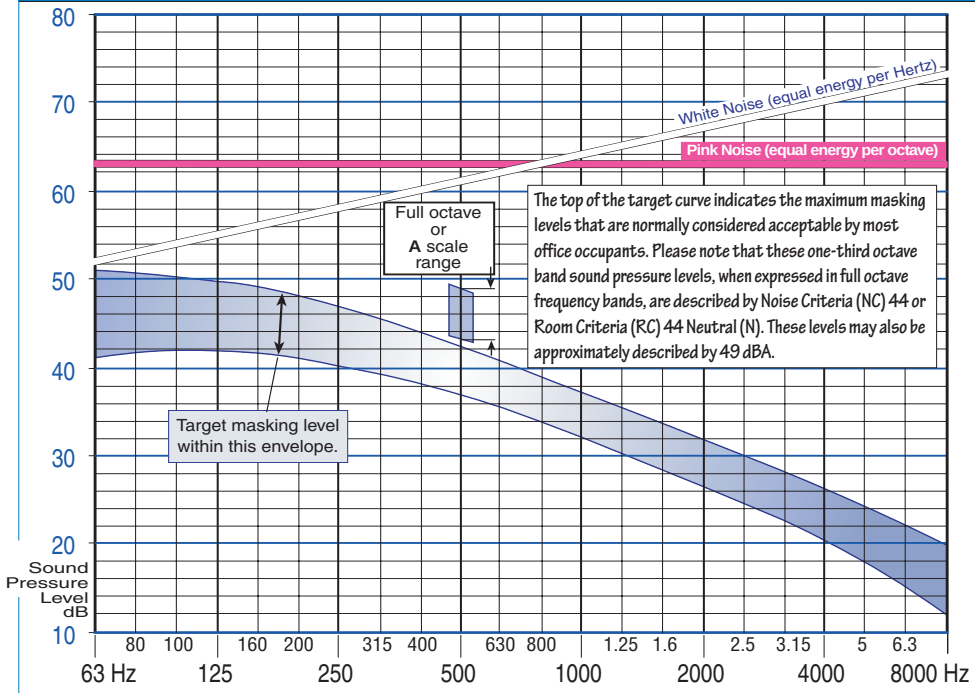
If this occurs, *slowly* lower the overall levels by about 6 dB for several hours and then increase the levels by 4 dB over a period of at least one hour, thus making a 2 dB net reduction. Then wait for reaction to this somewhat lower masking level.

If the air handling system is producing noise greater than the desired masking noise at lower frequencies, it may be necessary to increase the masking levels until they are about 4 or 5 dB below the mechanical system octave band noise levels.

If the air handling system is of the variable volume type, it may also be of the *variable noise* type. Thus, it is important to observe sound pressure levels at both extremes of the mechanical system noise. With lower HVAC air flow the masking system levels may be predominant. Increasing the masking noise levels at lower frequencies somewhat above the desired levels will provide less of a contrast for office occupants. Levels should be adjusted to make a smooth transition to masking system levels at 250 Hz or 500 Hz.

After the masking system has been adjusted and is placed in service, subjective observations should be made relating to speech privacy between work stations, acceptability of system levels in relation to annoyance and general acceptance of the office acoustical conditions.

Masking Level Envelope Target Curve
measured in one third octave bands



For users experienced with the setup of the original **LynTec PAC**

During the 10 years of the original PAC's production you've asked us for more flexibility and other features that we've built into the new PAC+. Your inputs have also provided us with a typical time/level scenario which we install as a **Factory program as shipped** (on the facing page).

What's different

Availability of multiple time/level cycles for every channel, every day.

Automatic Daylight Savings Time and Leap Year correction.

10 year backup battery life.

Smoother transitions by level steps of 3/8 dB.

Easier equalization setup with the **Manual level set & Hold** function.

What do the changes mean to me?

The added flexibility of up to six channels with up to 4 different cycles for every day requires more decisions on your part.

or

you may just use the factory programmed settings with slight time or level modifications to fit your application.

Field Programming conventions have changed!

Because of the additional capability, we've changed our approach to user programming.

The new PAC+ reduces calculations on your part by using a When do you want it up? (**Level up end time**) and When do you want it down? (**Level down end time**) approach to time settings. You tell the PAC+ ***when*** you want it, and ***what level*** you want it and the processor will calculate the time between steps to get you there. You still have slope control if you want it, but you don't have to set it. By the same token, you don't have to use more than one cycle, and all days may be the same. The capability is there if you need it, just follow the prompts and answer yes or no.

You don't have to wait to see what the PAC+ will do at a specific time or day.

The new PAC+ updates instantly. If you change the day or time in the CURRENT TIME position, all channels will immediately step to the level required by the program for that time as soon as you enter it with a ***second*** ➡.

You can monitor the attenuation level of each channel with the CHANNEL switch.

The **dB ATTENUATION LED**s show the ***span*** of the program, with the ***bright one*** showing the attenuation ***now***.

Now, we hope we've aroused your curiosity. You'll need to read on!

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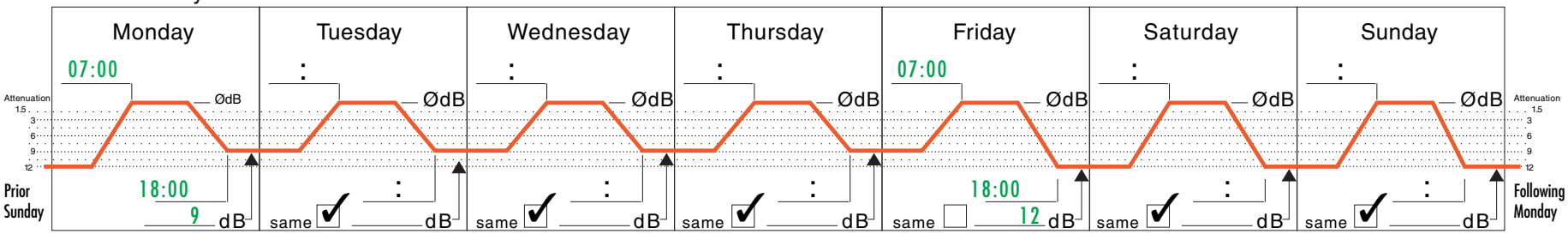
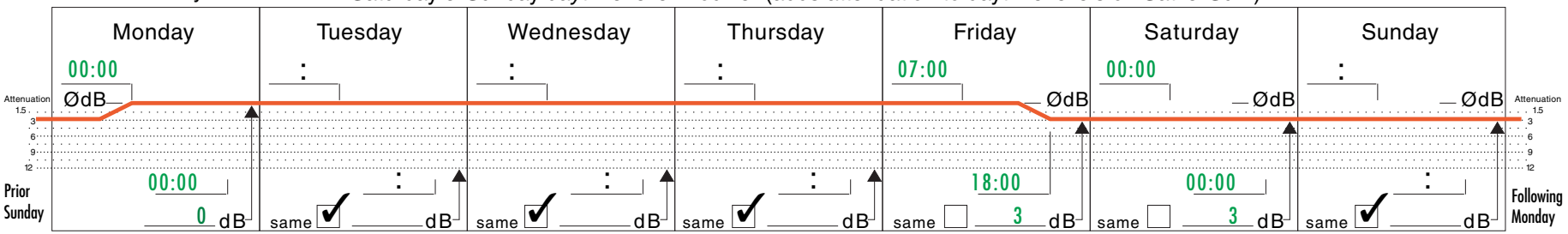
020-0017-10.3

Channel **A** Cycle **1**



Channel **A** Cycle **2**

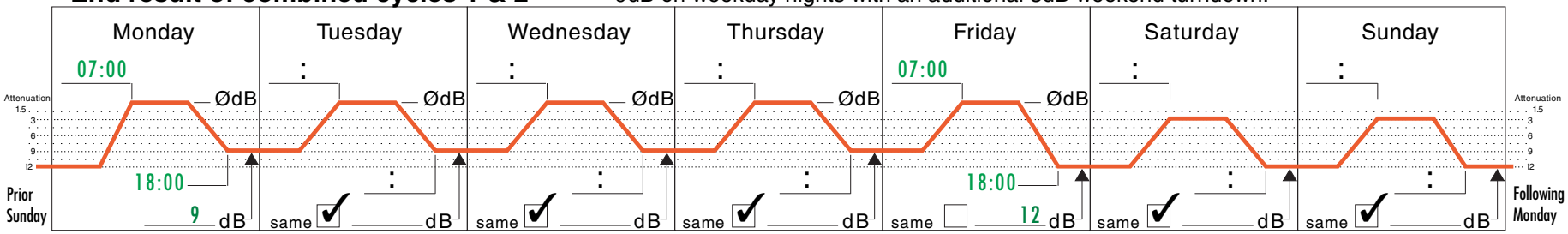
Saturday & Sunday *daytime* level modifier (adds attenuation to daytime levels on Sat. & Sun.)



Day-Night cycle, turned down 3dB further on Friday, Saturday & Sunday night.

End result of combined cycles 1 & 2

-9dB on weekday nights with an additional 3dB weekend turndown.



020-0017-09.3&14 Factory.eps 9/12/05

Factory program as shipped

The **CURRENT TIME** and **DATE** are set to reflect your time zone. Daylight Saving Time is enabled unless you specified otherwise.
This 2 cycle program is driving ***all*** channels installed. All other channels are a ***copy*** of A. All ***rates*** are 30 minutes.
The Slo-Start end date is factory set to April 15, '96, so the Slo-Start cycle has long since been completed.
You may change any parameter to suit your application.
or
You may enter a complete new program after *resetting* all preset times to ØØ:ØØ & attenuation levels to Ø by resetting the **DATE** to Jan 1 91 and manually locking the system by pressing both the ⇧ and ⇩ keys *simutaneously* for 2 seconds. Manually locking the memory with a 1/1/91 date clears all time and level programming, resetting them to Ø.

PRODUCT DESCRIPTION

The **LynTec** PAC+ is a multi-channel, multi-time, level controller capable of controlling up to six individual channels of audio.

WHAT IT DOES

The **LynTec** PAC+ controls each channel's audio path with a digital attenuator which steps in 3/8 dB steps for smooth response. A lithium battery backup system supports the internal quartz clock and user programmed memory during power outages. Any channel may contain an optional pink noise generator, for producing masking noise, or a program channel used for controlling music, paging or signalling tones.

All channels may track a master channel, or each channel may be individually programmed for up to 4 cycles per day and each day's program may be different.

Leap year is automatically calculated to provide for February 29th.

Daylight Saving Time compensation is automatic and may be disabled for those locations that do not adhere to the DST standard.

The DST standard, which changes in 2007 and all PAC+ units shipped after 8/05 conform to, has clocks springing forward one hour at 02:00 on the first Sunday in April (2nd Sunday in March 2007) and falling back one hour at 02:00 on the last Sunday in October (1st Sunday in November 2007).

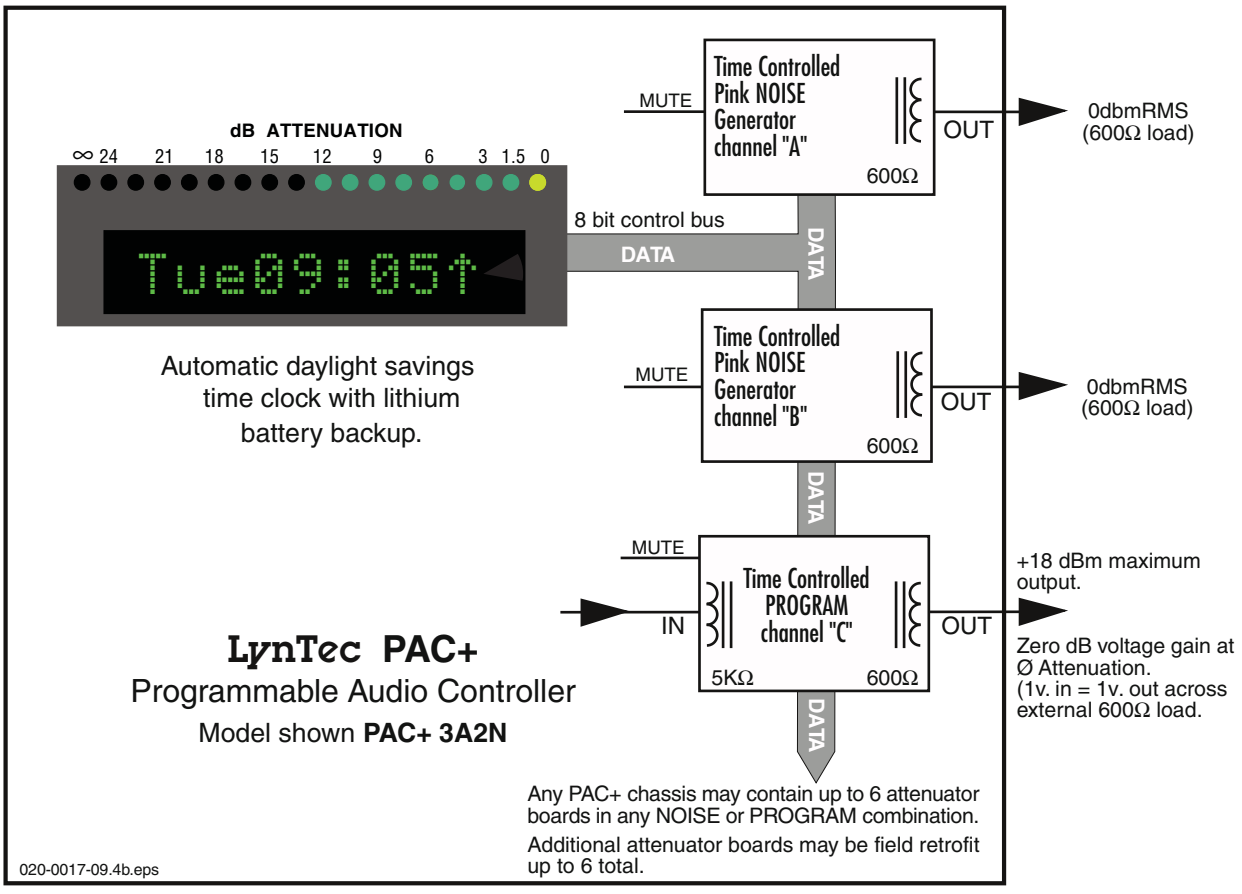
If you have an earlier PAC+ see http://www.lyntec.com/ 139-0432_DST Upgrade.pdf for your options to adapt to the new DST time scheme.

A SLO-START function is standard on any PAC+ having Noise channels. SLO-START provides a slow turn up of masking noise, reducing the psychological impact of adding masking to occupied spaces.

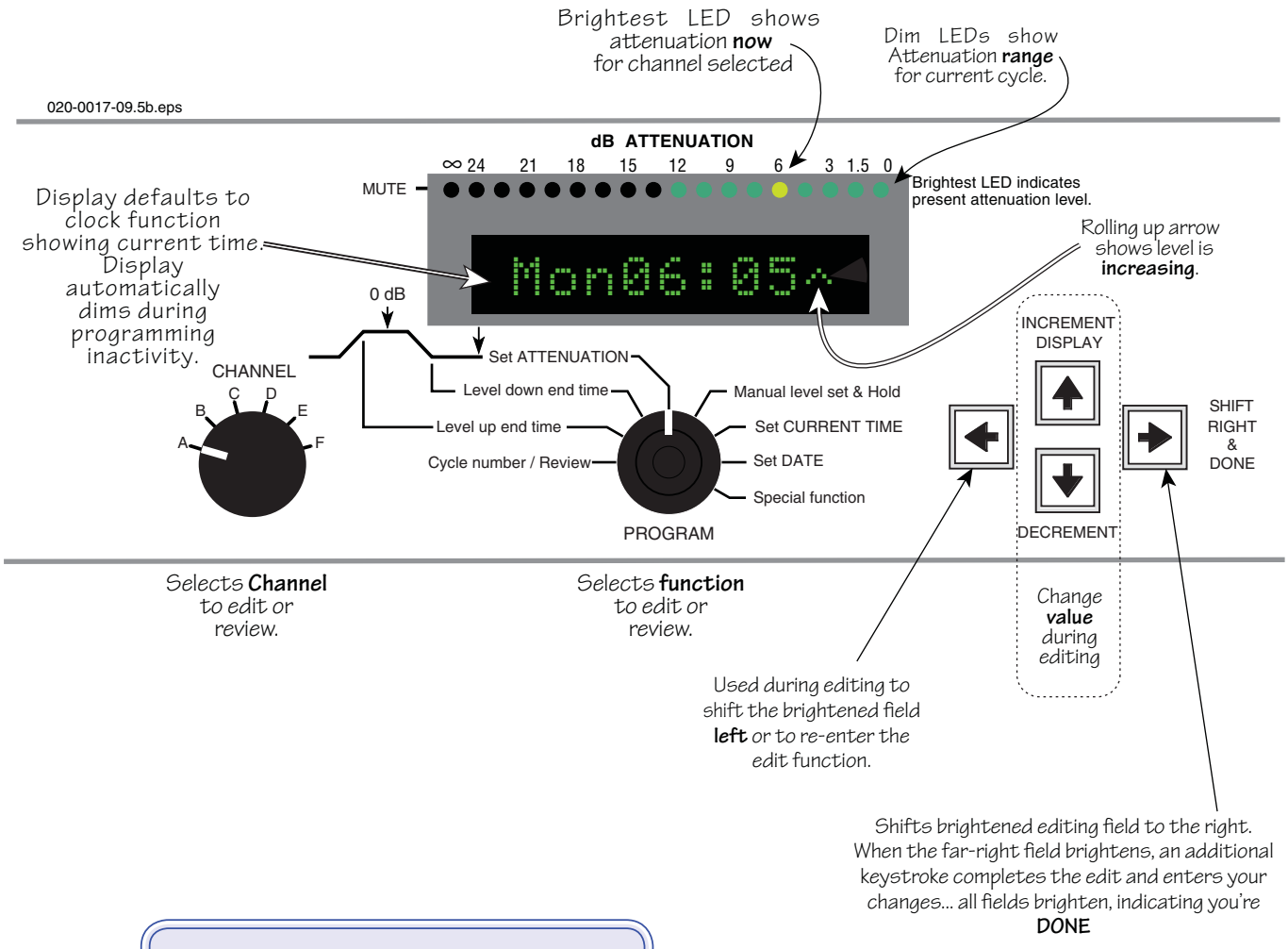
Accessible from the **Special function** switch position, SLO-START adds ten steps of 1.5 dB per day attenuation to all programmed levels until the programmed future slo-start date. Each following midnight, the level is raised 1.5 dB until the normal Ø dB daytime level is achieved. The day/night attenuation cycle integrity is maintained, all levels have 1.5 dB per day added. Different SLO-START dates may be set for different channels.

SLO-START eases the masking up automatically, eliminating costly return trips.

BLOCK DIAGRAM



FRONT PANEL HIGHLIGHTS



UNLOCK CODE

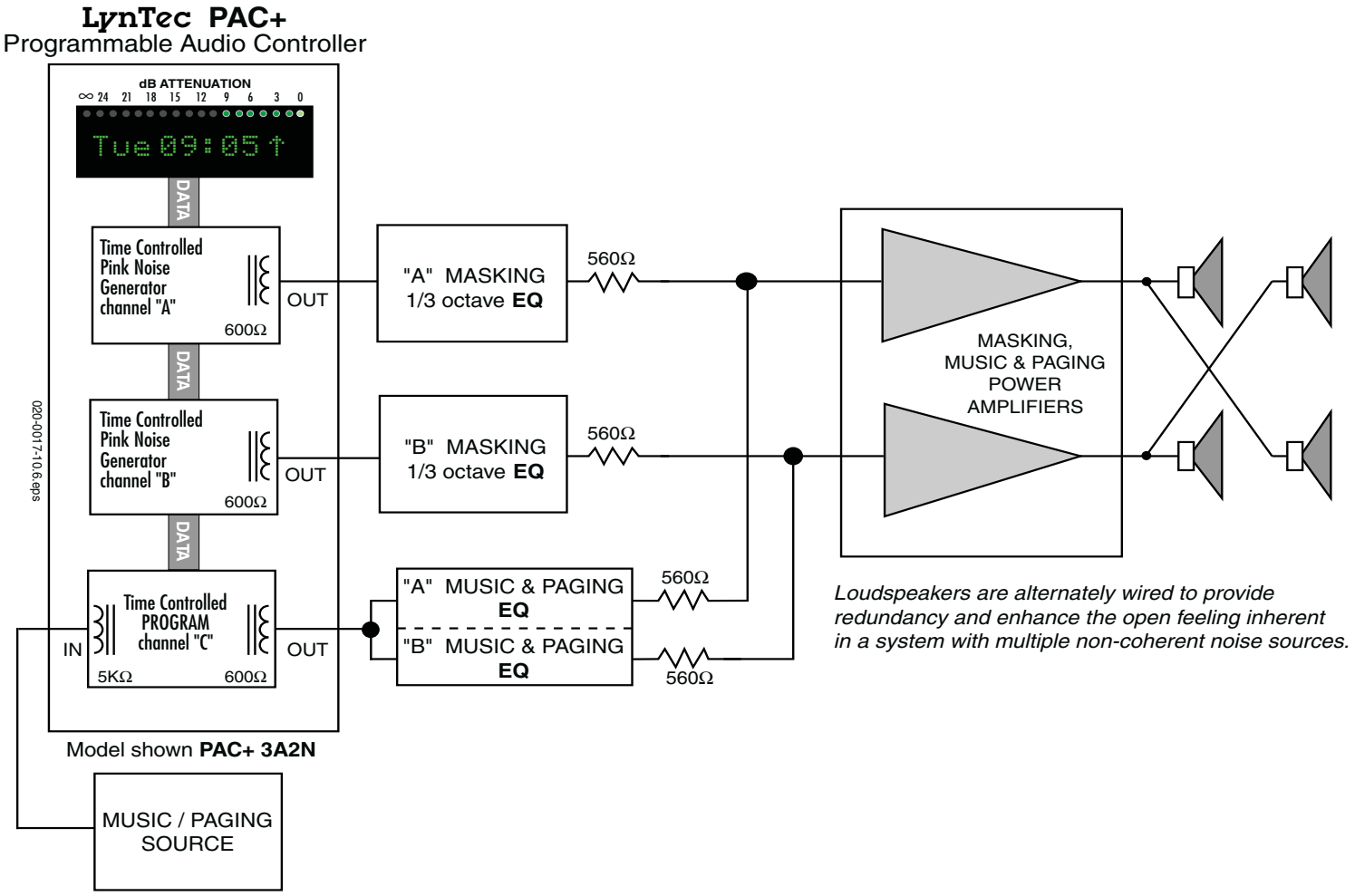
Anyone may view the programmed times and levels with the front panel controls.

All parameters are locked after 5 minutes of programming inactivity.

The UNLOCK code is printed on a label on the back of the unit.

Typical 2 channel Masking System

Mixed music and paging is time/level
controlled at the same rate as the masking
assuring day/night consistency



Loudspeakers are alternately wired to provide redundancy and enhance the open feeling inherent in a system with multiple non-coherent noise sources.

REAR PANEL CONNECTIONS & LABELLING

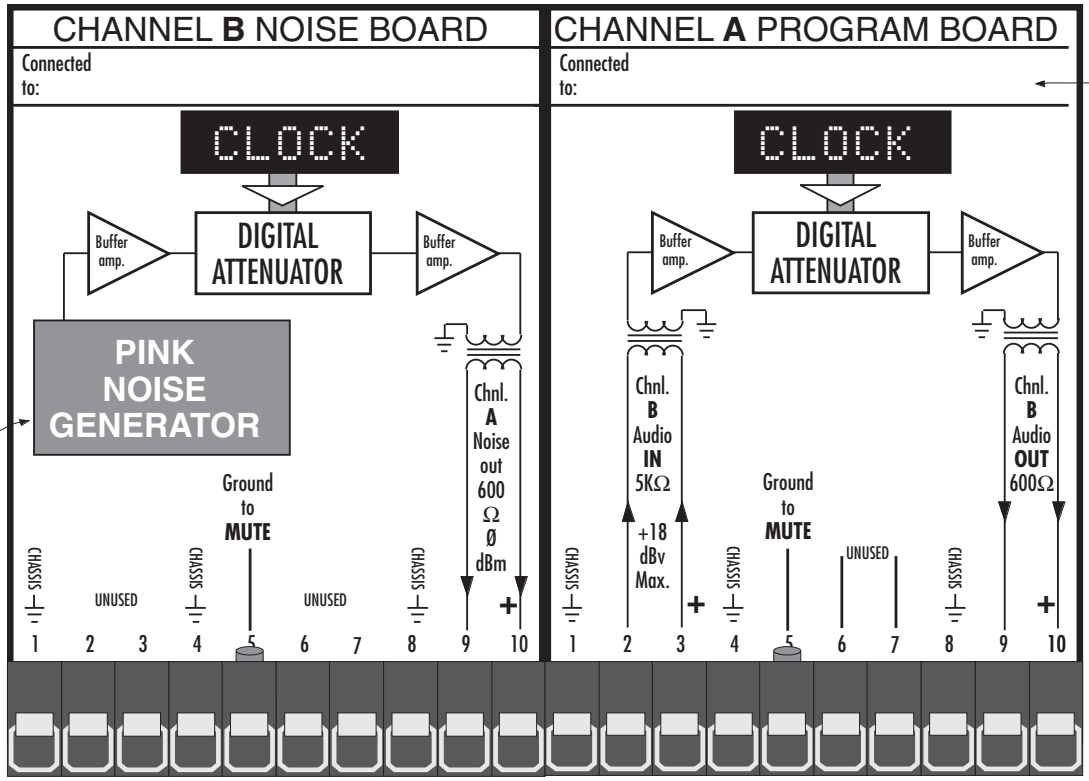
Depending on the model ordered, the PAC+ may have up to 6 attenuator boards maximum installed in any PROGRAM/NOISE mix. Additional attenuator boards may be field retrofit.

The PROGRAM attenuator boards are used for time/level control of any audio source, inserting from 1.5 to 24 dB in 3/8 dB steps for smooth transitions.

The PROGRAM attenuator boards are typically used to provide tracking timed level control of paging, background music, or signalling tones consistent with the time controlled masking channels. Another use is to control music with time of day and day of week.

The NOISE attenuator boards generate pink noise and time control its output level.

Open white space on mylar label for field connection information. Use Sharpie or other permanent marker. WD-40 on a rag will erase it.



Each channel's PINK NOISE GENERATOR is independent and not phase coherent with other channels.

Most masking systems are 2 channel.

Each PAC+ channel has a separate noise generator and a digital attenuator.

Separate equalizers, power amplifiers and loudspeaker systems complete the system.

A 2 channel system provides redundancy, less localization and a perception of openness.

MUTE
Useful for muting masking noise & background music / routine paging during **emergency** paging.

Reduces the audio power required for good emergency paging intelligibility.

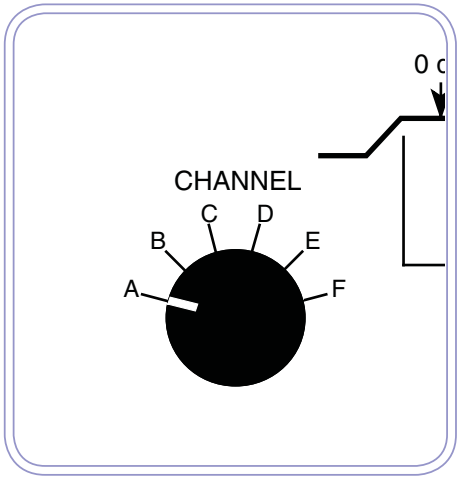
Ground to MUTE. Each mute line is a +10v, 10 ma. source. All mute lines may be tied in parallel to a common **EMERGENCY PAGE** contact.

An external LED may be inserted as a remote MUTE indicator. Do NOT use a series resistor. If more than 4 channels are muted, a 68Ω, 1/4w resistor in parallel with the remote LED will limit the remote LED current to ≤30 ma.

Controls and their Functions

BOLD FACE = Panel designations

CHANNEL

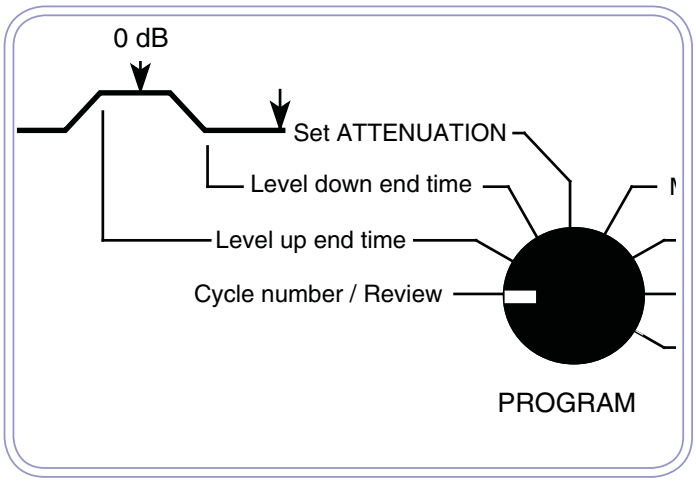


The **CHANNEL** switch selects a channel to display. Editing is allowed if the system is unlocked. (See UNLOCK code label on rear of unit)

A `NO Channel` message indicates there is no board installed for that switch position.

A `B Copies A` message when you switch to B channel indicates B channel's time/level program is a duplicate of the A program. Editing, therefore, may be accomplished only in the A position.

PROGRAM — Cycle number / Review



The **Cycle number** position selects which cycle number and the day you can review or edit.

This position is your **entry** point into the following three switch positions. Your decision at this point is **which** cycle and day you want to look at or edit.

The variables you may review or edit in this position are `Cycle 1, 2, 3` or `4` and `Mon` through `Sun.`

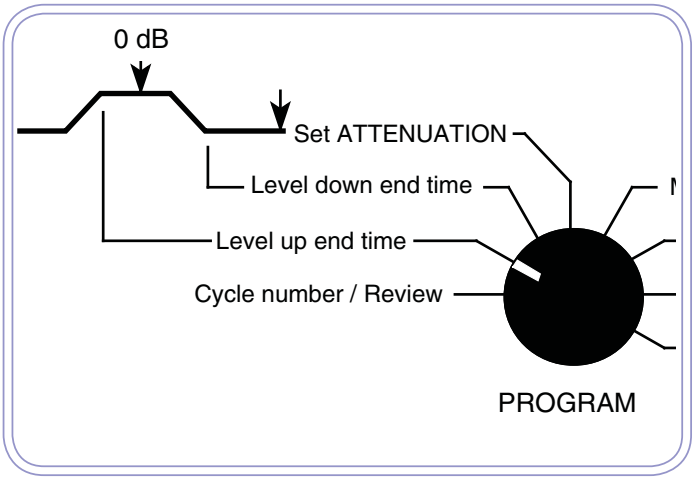
The ← & → keys will **brighten** the field that you are entering to view... the cycle or the day.

The ↑ & ↓ keys provide the change mechanism for changing the cycle number if more than one cycle is programmed and to access the day of the week.

Controls and their Functions

BOLD FACE = Panel designations

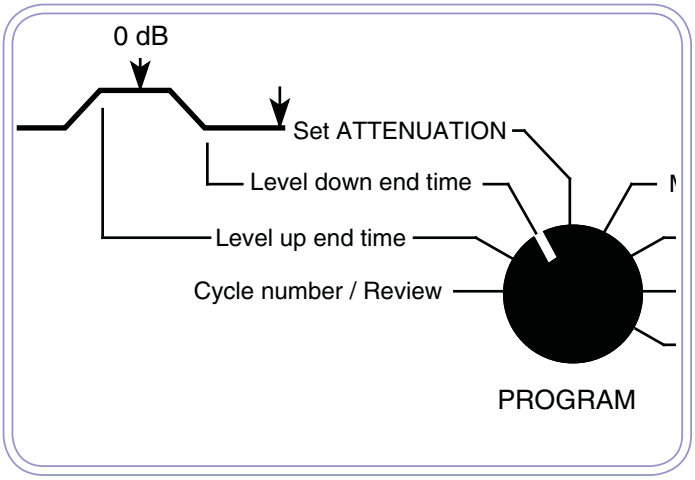
PROGRAM — Level up end time



The **Level up end time** is the point where the attenuation is zero, in masking systems this is normally the daytime level.

The slope of the rise is set in the **Set ATTENUATION** switch position.

PROGRAM — Level down end time



The **Level down end time is the point where the attenuation reaches maximum, normally the nighttime level in masking systems.**

The slope of the descent is set in the Set ATTENUATION switch position.

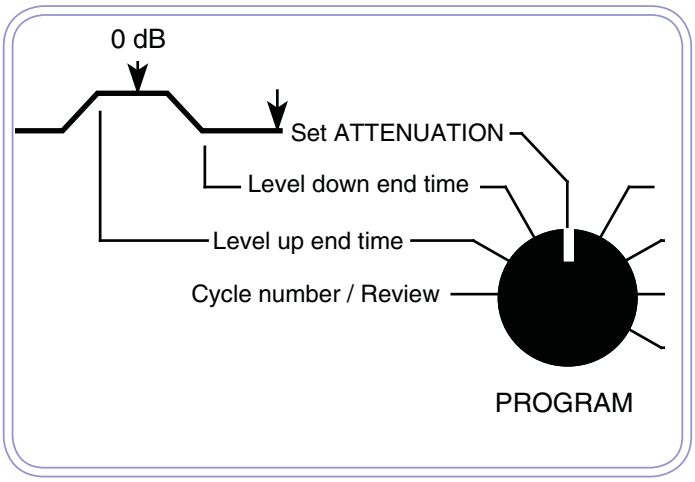
Remember, nothing **changes** until you enter your new numbers by pressing the ➔ key a **second** time when the right field is brightened. All fields then **brighten**, and confirm successful entry. If you change the PROGRAM switch position before the second right-most ➔ keystroke, none of your **new** numbers will be entered and the old data will be retained.

Ask yourself... I changed a number... did I enter it with a second ➔ keystroke? Did all fields brighten? If either answer is no... your edit wasn't successful, the old numbers remain. Try again.

Controls and their Functions

BOLD FACE = Panel designations

PROGRAM — Set ATTENUATION



The **Set ATTENUATION** position sets the attenuation from 1.5 to 24 dB in 1.5 dB increments corresponding to the dB ATTENUATION LEDs at the top of the display.

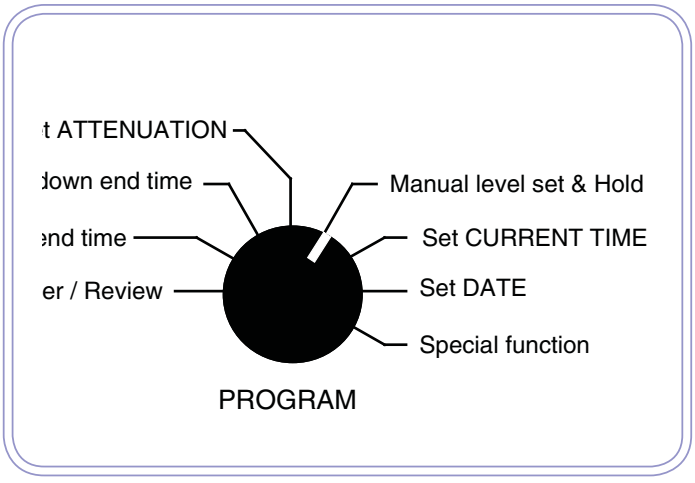
The slope or transition time of the rise and descent is set by accessing the left-most field with the ← key. The range of slopes is 1, 2, 5, 10, 15, 20, 30, 45 & 60 minutes.

To provide smooth transitions that are inaudible even with a pink noise source, the level changes are made in 3/8 dB steps... four for each **ATTENUATION LED step.**

Once you've set the slope and attenuation level for Monday, the next step is to return the switch to Cycle number / Review to advance to Tuesday. Answering the question `Tu Same? Yes` → will advance you to Wednesday.

A ↓`No` → lets you enter new settings for Tuesday.

PROGRAM — Manual level set & Hold (EQ helper)



The Manual level set & Hold provides a hassle-free method of setting the level anywhere you want it... irrespective of what the clock wants it to be.

During equalization and speaker level adjustments, this position provides an easy way to set the levels. If you're setting up a 2 channel system where `B Copies A`, all channels that are copies will follow the channel you're holding in the Manual position.

Unlock the system, select the channel/s you want to equalize and switch to the **Manual** position. The level determined by the clock will come up in the window.

Adjust it with the ↑ or ↓ key to the level you want and hit the → key to enter it. The display will then show `Hold xx.x dB` with your attenuation numbers brightened.

You can now use the ↑ or ↓ keys to run the level up and down... anywhere you want it.

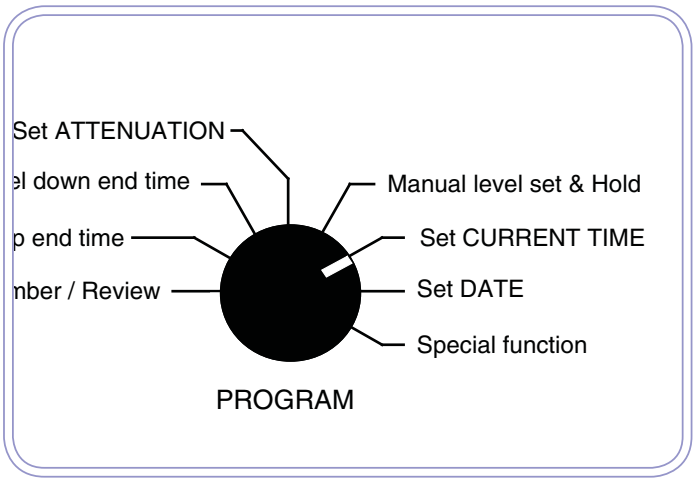
What does -9 dB sound like for nighttime level? Set it and walk around... no worry about the level changing due to a clock cycle. The PAC+ will remain unlocked.

The channels you've held will revert to their proper programmed level as soon as you switch out of the **Manual** position. There is no need to run the clock through a cycle to get to the correct level, the time update is immediate.

Controls and their Functions

BOLD FACE = Panel designations

PROGRAM — Set CURRENT TIME



The **Set CURRENT TIME** position provides a method to set the actual time of day.

Assuming an UNLOCKED condition, when you enter this switch position the hour will be brightened. You may change it with the ↑ or ↓ keys. The PAC+ is programmed in 24 hour time (13:00 = 1 PM)

Notice that the colon is **NOT flashing**.

So far you are editing the display only, you have NOT changed the clock time **yet.** Suppose you also need to change the day or the minute. The ← or → keys will get you into those fields and the ↑ or ↓ keys will adjust the numbers. To start the clock with your edited numbers, set the minutes to one more than your watch reads. When your watch reaches 59 seconds press the → key once more to update and start the clock with your numbers.

All fields of the display will brighten and the colon will begin flashing indicating you're **DONE**.

Remember, nothing **changes** until you enter your new numbers by pressing the → key a **second** time when the right field is brightened. All fields then **brighten**, and confirm successful entry. If you change the PROGRAM switch position before the second right-most →keystroke, none of your **new** numbers will be entered and the old data will be retained.

Ask yourself... I changed a number... did I enter it with a second →keystroke? Did all fields brighten? If either answer is no... your edit wasn't successful, the old numbers remain. Try again.

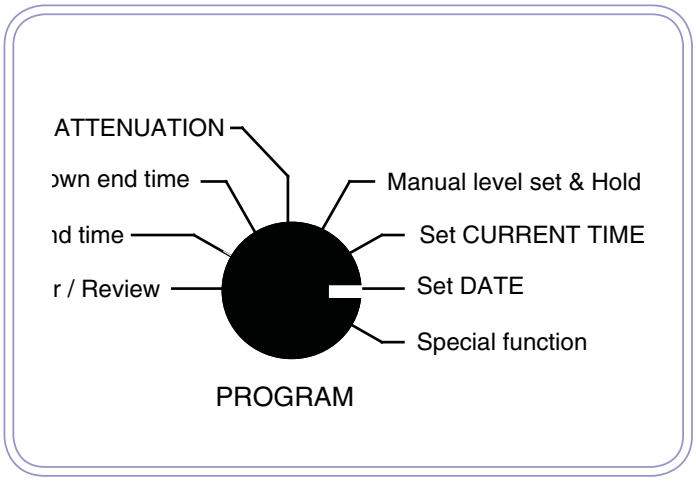
IMPORTANT NOTE: You must set the **correct day** of the week in the **CURRENT TIME** switch position for the date you've set in the **DATE** switch position.

The clock chip is not smart enough to know what day the 1st of April is. If you change either the day or the date you'll need to make sure they match a calendar.

For PAC+s manufactured before 8/05, serial numbers below xxxx625, the built-in Daylight Savings Time function was made obsolete by the new law extending DST by 3 weeks, effective 2007.

See http://www.lyntec.com/139-0432_DST_Upgrade.pdf for options.

PROGRAM — Set DATE



This position provides a method to set the date.

Assuming an UNLOCKED condition, when you enter this switch position, the month field will be brightened. You may change it with the ↑ or ↓ keys. Pressing the → key will advance you into the day and year fields for editing.

If you enter an erroneous date such as Feb. 30th, the clock chip **is** smart enough to know it and you'll get an `INVALID` message... then the display returns to the date so you can fix it.

Once you've entered a valid date and press the → key, you'll get a `Dlt Svng?Y` question.

If you want Daylight Savings Time enabled, press the → key to complete the edit.

To disable DST use a ↑ or ↓ key to change the `Y`es to `N`o and then complete the entry with the → key.

The brightened current date will appear, confirming your settings.

Remember, nothing **changes** until you enter your new numbers by pressing the → key a **second** time when the right field is brightened. All fields then **brighten**, and confirm successful entry. If you change the PROGRAM switch position before the second right-most → keystroke, **none** of your **new** numbers will be entered and the old data will be retained.

Ask yourself... I changed a number... did I enter it with a second → keystroke? Did all fields brighten? If either answer is nooooo... your edit wasn't successful, the old numbers remain. Try again.

IMPORTANT NOTE

Be sure that the date and the day-of-the-week are accurate.

The day-of-the-week is set in the **Set CURRENT TIME** switch position

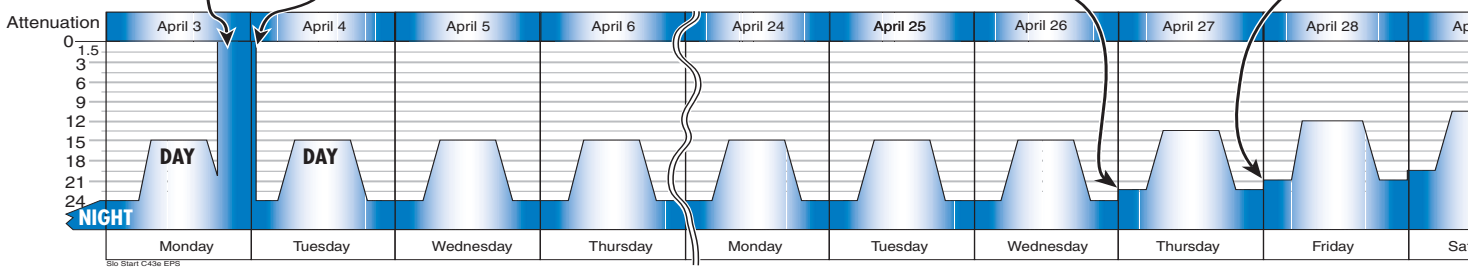
SLO-START

After-hours equalization & loudspeaker level adjustments using **Manual level set & Hold**.

Time control returns as soon as **PROGRAM** switch leaves **Hold** position, subject to SLO-START ***plus*** the normal day/night cycle.

Tenth 1.5 dB step is removed by SLO-START, **nine** left.

Ninth 1.5 dB SLO-START,



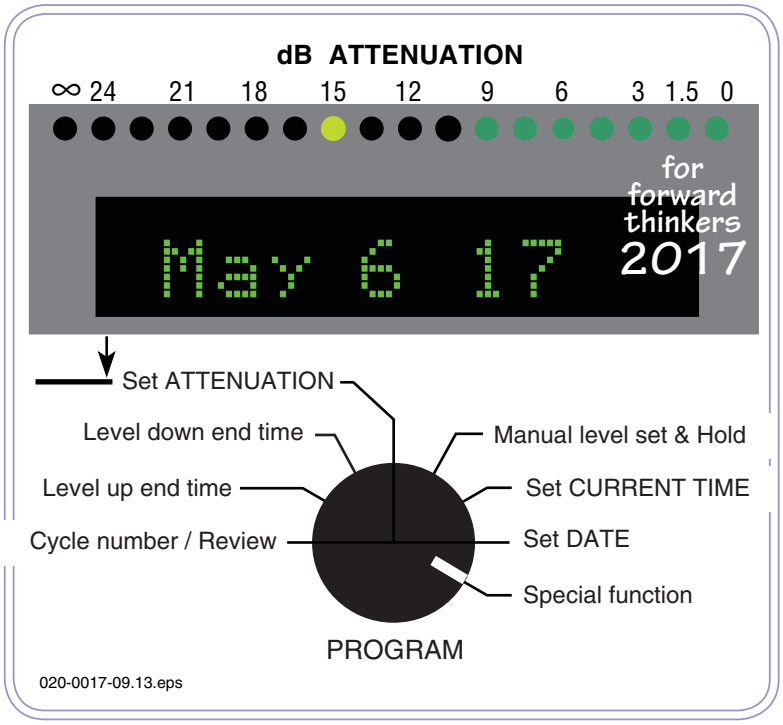
First day of SLO-START. Day: -13.5 dB Night: -22.5 dB

2nd day of SLO-START. Day: -12 dB Night: -21 dB

Controls and their Functions

BOLD FACE = Panel designations

PROGRAM — Special function (SLO-START)



The SLO-START function is standard on any PAC+. Slo-Start provides a slow turn up of masking noise, reducing the psychological impact of adding masking noise to occupied spaces.

Accessible from the **Special function** switch position, you program the date Slo-Start **ends**. When you complete the entry with the ➔ key, all fields **brighten** confirming your entry. Slo-Start immediately adds 15 dB of attenuation to the channel you're editing and any copies of it until 10 days before the programmed future Slo-Start date.

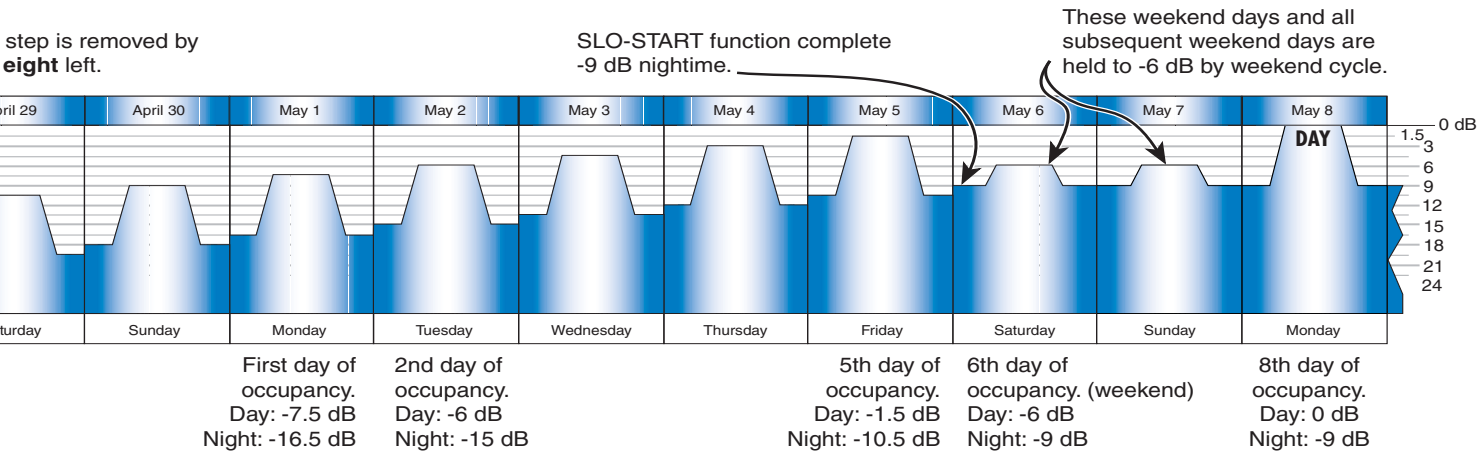
Notice the bright **ATTENUATION** LED is out of the normal span of dim LEDs. This is a normal indication during Slo-Start and during Power Up, both functions add attenuation with Slo-Start having priority over Power-Up.

At midnight, ten days prior to your programmed Slo-Start end date, Slo-Start begins, removing 1.5 dB. Each following midnight, the level is raised 1.5 dB until the normal Ø dB daytime level is achieved. The day/night attenuation cycle integrity is maintained, all levels have 1.5 dB per day added. Different Slo-Start dates may be set for different channels.

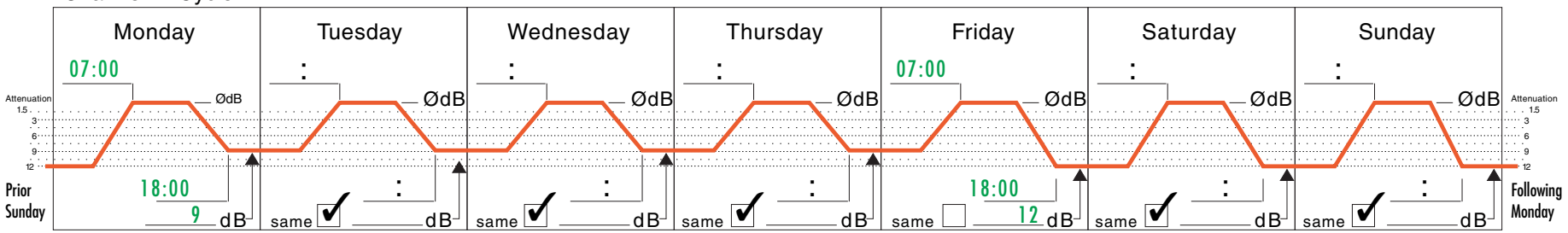
Example shown below: Floors 1 & 2 will be occupied on May 1, 2017. Suppose we want the masking level to be 7.5 dB below the full daytime level on the first day of occupancy. Because the Slo-Start function adds 1.5 dB per day, we must set it to end in 5 days to have 7.5 dB remaining on May 1. Channels A & B are programmed to end Slo-Start on May 6, 2017.

Assuming that May 6, 2017 is in the future, 15 dB is added to channels A & B. When the clock rolls over to April 27th.....1.5 dB is removed from the slo-start adder. On May 5th, ten mid-nights later, the level has been raised 15 dB leaving it at the normal 9 dB below the full daytime level. SLO-START is complete, easing the masking up automatically without costly return trips.

EXAMPLE

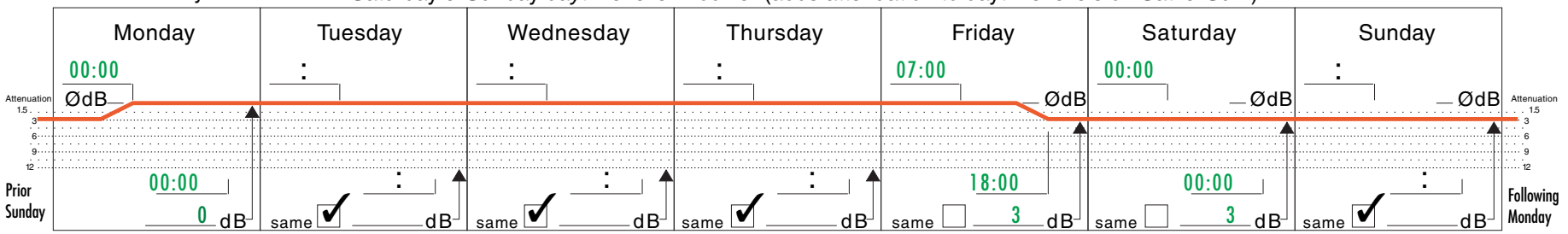


Channel **A** Cycle **1**



Channel **A** Cycle **2**

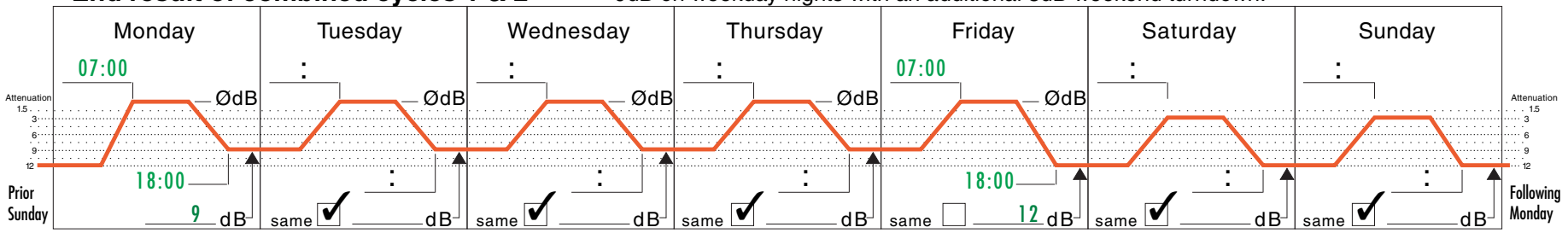
Saturday & Sunday *daytime* level modifier (adds attenuation to daytime levels on Sat. & Sun.)



Day-Night cycle, turned down 3dB further on Friday, Saturday & Sunday night.

End result of combined cycles 1 & 2

-9dB on weekday nights with an additional 3dB weekend turndown.



020-0017-09.3&14 Factory.eps 9/12/05

Factory program as shipped

The **CURRENT TIME** and **DATE** are set to reflect your time zone. Daylight Saving Time is enabled unless you specified otherwise.
This 2 cycle program is driving ***all*** channels installed. All other channels are a ***copy*** of A. All ***rates*** are 30 minutes.
The Slo-Start end date is factory set to April 15, '96, so the Slo-Start cycle has long since been completed.
You may change any parameter to suit your application.
or
You may enter a complete new program after *resetting* all preset times to ØØ:ØØ & attenuation levels to Ø by resetting the **DATE** to Jan 1 91 and manually locking the system by pressing both the ⇧ and ⇩ keys *simutaneously* for 2 seconds. Manually locking the memory with a 1/1/91 date clears all time and level programming, resetting them to Ø.

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020-0017-10.15

FIELD TIME/LEVEL PROGRAMMING RECORD

for

LynTec PAC+ Programmable Audio Controller

Channel____ Cycle____

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
Attenuation 1.5 3 6 9 12	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	Attenuation 1.5 3 6 9 12
Prior Sunday	: ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	Following Monday

Channel____ Cycle____

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
Attenuation 1.5 3 6 9 12	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	Attenuation 1.5 3 6 9 12
Prior Sunday	: ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	Following Monday

Channel____ Cycle____

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
Attenuation 1.5 3 6 9 12	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	: __ ØdB	Attenuation 1.5 3 6 9 12
Prior Sunday	: ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	same ☐ : ____ dB	Following Monday

020-0017-08.15 FieldPgm.eps 7/15/00

Job________________ Floor______________ Date__________________ Programmer______________ Contractor ____________________

Comments____

____

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DETAILED SPECIFICATIONS

AUDIO PATH PERFORMANCE

Maximum input level:	6.16 volts RMS sine wave, 20 Hz - 20 kHz. [+18 dBm, 600 Ohms = output clip point]
Program channel audio input impedance:	5K Ohms balanced. (bridging transformer) If noise sources are specified, the inputs are internally connected to noise sources without input bridging transformers.
Maximum output level:	+18 dBm (6.16 volts RMS sine wave, 20 Hz-20 kHz.) [clip point]
Audio output (all channels):	Transformer isolated output to feed 600 Ohm line. (Typical output impedance is 275 Ohms at 1 kHz.)
Normal operating levels:	
Noise channels:	0 dBm RMS (0.775 volts RMS) [18 dB headroom]
Program channels:	-6 dBm (0.389 volts RMS) [24 dB headroom]
Frequency response (program channels):	±1 dB, 20 Hz - 20 kHz, 0 dBm.
Residual hum & noise:	75 dB or more below maximum output. (20 Hz to 20 kHz)
Added distortion:	Less than 0.5% total harmonic distortion added.
Time controlled attenuation:	Programmable from 0 to 24 dB in 1.5 dB steps.
Transition time:	Time required to make a full programmed level change: Adjustable from 1 to 60 minutes. Default: 30 minutes Field adjustment options: 1, 2, 5, 10, 15, 20, 30, 45, 60 minutes, accessible in Set ATTENUATION position.
Attenuation at 0 step [daytime] (program channels):	0 dB within ±0.1 dB, loaded with 600 Ohms. (unity voltage gain)
Attenuation accuracy:	±0.17 dB of step setting. 0 to 30 dB
Channel to channel attenuator tracking accuracy:	Within ±0.2 dB. (for stereo applications)
Channel to channel crosstalk rejection:	More than 80 dB.
MUTE:	All channels are provided with a MUTE terminal. An external contact closure will light the red MUTE LED on the rear and will instantaneously mute that channel's audio. The MUTE terminal supplies +10v @10 ma. A remote indicator LED may be used in series. (Do NOT use a series resistor) Any number of MUTE lines may be paralleled... each one will source 10 ma. MUTE may be used in masking systems to mute the masking noise in an emergency, reducing the audio power required for emergency paging.

OPTIONAL NOISE GENERATORS

Noise generator/s:	Non-coherent pink noise generator/s are optional, located on attenuator boards. The noise is produced by digital simulation with sequence limiting to reduce 'thumping'. The typical cycle time is one minute.
Noise generator output level: (Daytime level)	0 dBm RMS into 600 Ohm load. Flat within ±2 dB from 63 Hz to 16 kHz. (As measured with a constant percentage bandwidth analyzer)

CLOCK & DISPLAY

Controller clock:	Quartz crystal controlled plug-in clock module. Field replaceable.
Expected life:	10 years of un-powered operation.
Battery backup:	Lithium battery built-in to plug-in clock module.
Clock functions:	Automatic leap year. 24 hour time displayed on a low voltage fluorescent, auto-dimmed display. Daylight Saving Time: (All units shipped after 8/05 are adapted to both the old & new DST protocol) Automatic daylight saving time advances an hour at 02:00 the first Sunday of April and retards an hour at 02:00 on the last Sunday of October through 2006. Beginning in 2007, automatic daylight saving time advances an hour at 02:00 the second Sunday of March and retards an hour at 02:00 on the First Sunday of November. The auto-DST function may be easily disabled for locations not using Daylight Saving Time. When you set the DATE, answer the dialog: `Dlt Svng? Yes or No.`
Clock accuracy:	±1 minute per month. Resolution: 1 minute.

DETAILED SPECIFICATIONS continued

dB ATTENUATION LEDs

The brightest LED shows the present attenuation. The other dimmed LEDs show the range of attenuation for the cycle and channel selected.

PROGRAMMABLE FUNCTIONS

Each channel may be field programmed for up to 4 level cycles per day.
A different cycle set may be programmed for each day of the week.

Front panel CONTROLS

CHANNEL switch: Selects the channel that is being viewed on the display.

PROGRAM switch: Selects programmable functions. The active programmable field brightens.

Cycle number / Review: Provides a method to review each cycle's end times, attenuation and transition time.

INCREMENT DISPLAY: ↑ Advances active field.

DECREMENT DISPLAY: ↓ Decrements active field.

SHIFT RIGHT & DONE: → Shifts active field to right one character. An additional keystroke when the right-most field is bright enters the information (DONE). Entry is confirmed as all fields brighten.

Shift left: ← Shifts active field to left. After DONE entry, allows resumption of field editing by backing into a single brightened field ready for editing.

LOCK / UNLOCK code (Key on rear panel): System programming is automatically locked out after 4.25 minutes of programming inactivity. The display reverts to current time irrespective of the program switch position and dims to extend display life.

Anyone may determine the program points from the front panel with the CHANNEL & PROGRAM switches but all changes are locked out until the LOCK / UNLOCK sequence is entered. The Unlock code is on a back label.

SLO-START

The SLO-sTART function provides a slow automatic turn-up of the masking noise level at initial turn-on. After normal equalization at the daytime level, the Slo-Start end date is set to the date you want the system to be at full volume. The Slo-Start end date may be set at any future date. If it is set more than 10 days in the future, 15 dB is added to the normal day/night cycles until Slo-Start begins. The normal day to night ratio is maintained throughout the Slo-Start cycle.

Any combination of channels may be slo-started and the completion time may be different for different channels. Example: Channels A & B Slo-Start beginning July 6, 2007 when floor 2 is scheduled to be occupied and reach full daytime level 10 days later when the Slo-Start end date is reached. Channels C & D begin their Slo-Start cycle on January 20, 2007 when floor 3 is scheduled to be occupied, ending 10 days later on the 30th.

Example: If the normal night level is set at -9 dBm when Slo-Start begins, the day level will be -15 dBm. First day: -15 dBm, night: -24 dBm. Second day: -13.5 dBm, night: -22.5 dBm. Third day: -12 dBm, night: -21dBm. Each day at midnight the level is increased 1.5 dB until the normal level is achieved in 10 days. The Slo-Start then becomes inactive, having served its purpose by easing up the masking automatically.

POWER-UP FUNCTION

At initial power-up the PAC+ will start all channels at 24 dB attenuation and increase the level slowly to the programmed level while displaying a Power Up message and a scrolling up arrow to indicate the level is increasing. This one minute cycle provides a smooth resumption of masking noise after a power failure. Power glitches or power failures less than 4 seconds long are ignored by the Power Up function.

Brownout resistance: Typical power supply regulator dropout is 85 volts, 60 Hz A.C. Pink noise output level slowly dwindles below 85 volts and stops at 55 volts.

POWER SUPPLY

100-240vac, 47-63 Hz, 30 watts maximum. (4 watts typical)
Safety ratings: The internally fused, switching power supply attached to the side of the **PAC+** is UL, CE, CSA and TUV listed.

FCC DATA

EMI/RFI: The PAC+ meets the class A EMI/RFI requirements of FCC part 15.

Testing and replacing the clock chip

MECHANICAL SPECIFICATIONS

Standard EIA rack mount: Width: 19.00 inches, Height: 3.5 inches, Depth behind mounting surface: 10 inches max. Extension forward from mounting surface: 0.875 inch max. Weight: 10 pounds max.

Audio connections: Audio & mute connections are on screw activated terminal strips located on the rear panel.

Power inlet: IEC 320 receptacle NO power switch.

Cord supplied: 6 ft., U.S, 3 wire grounded.

ENVIRONMENTAL SPECIFICATIONS

Maximum relative humidity: 95% non-condensing.

Operating temperature:40° F to 120° F

MODEL NUMBER EXPLANATION

Prefix (all models)	Attenuator Channels	Noise Sources
PAC+	3**A**	2**N**

EXAMPLES:

A **PAC+ 3A2N** would have **3** total **A**ttenuator channels, one program channel and **2** built-in **N**oise generators and built-in SLO-START.

A **PAC+ 6A** would be fully populated with **6** channels of program type **A**ttenuator boards. Usable for any audio program material, the program boards have 5K Ohm bridging input transformers and 600 Ohm output transformers.

Additional channels (up to 6 total) may be field retrofit.

Testing the clock chip

Although Dallas Semiconductor, the manufacturer of the clock chip, quotes a 10 year un-powered life for the time-keeping device in the PAC+, we all know nothing can go wrang.

That's why we put the clock chip in a socket that's accessible by removing the top cover. ***But don't pull it out yet!***

When this manual was revised in 2007 we still hadn't had a clock failure (1st PAC+ shipped in 1992), so we can't tell you the failure symptoms. Suffice it to say if the clock is off by more than a minute per month since the unit was new, the chip is suspect. (Or someone has mis-set it.)

If the PAC+ has been installed for 5 years or more without being reset, the clock may be up to an hour off the correct time and still ***NOT*** need a clock replacement.

The customer may ***think*** it's not accurately compensating for daylight savings, when it 's just crystal tolerance accumulation. Daylight savings ***Spring-forth*** and ***Fall-back*** days may be the only time anyone looks at the PAC+ time.

Why?

The quartz crystal oscillator inside the potted Dallas clock assembly has a tolerance of ±1 minute per month. If it hasn't been synchronized for 5 years, or 60 months, it may be off up to an hour and still backup time fine.

To test the clock, wait until after hours when an interruption of noise won't be noticed. Make note of the **CURRENT TIME**. Record each channel's **Level up end time**, **Level down end time** and the **ATTENUATION** for each day using the Setup Record sheet on page 15.

It is important to review and record the times and attenuation levels of each cycle for each channel so you can reprogram the new chip ***if*** it needs replacement.

Pull the AC plug for at least 15 seconds.

Re-power the PAC+ by plugging it in.

Set the **PROGRAM** knob for **Set CURRENT TIME**. The display should indicate about the same time with a rising arrow on the right, indicating the noise is coming up slowly.

If the **CURRENT TIME** was retained, simply resynchronize the correct **CURRENT TIME** setting and confirm the level end times are correct.

Unlike a computer backup battery, the PAC+ has only called on the lithium battery when AC power hasn't been applied, the likelyhood of more than a few months of battery operation is remote. The Dallas part is expected to run for 10 years on the battery. There is no need to replace it until it fails and that might be after you retire.

If the clock has lost its brains and the **CURRENT TIME** has a major error, it is also likely that all of the time and level settings have been lost because they are stored in the clock chip's RAM.

If you've proved the battery is bad by the previous test. Please supply the PAC+ serial number and job name and location and call 800-724-4047 to order.

Two plug-in clock chip assemblies have been used. The DS1387 in Serial numbers up to TØØ2506 - shipped prior to 8/2000.

or

DS 17487-5, Sn TØØ3507 up - shipped after 8/2000.

You will probably want to leave the PAC+ in service until you receive the replacement clock assembly. Even if the battery won't support a power failure you can still reset the times and it will operate on AC O.K.

You'll have to remove the PAC+ from the rack to access 4 top cover screws. Detailed installation instructions come with the plug-in clock assembly.

020-0017-10.19

SAMPLE PROGRAM

for timed level control of
Cafeteria paging & background music
using
LynTec
PAC+ Programmable Audio Controller

Clearing the slate

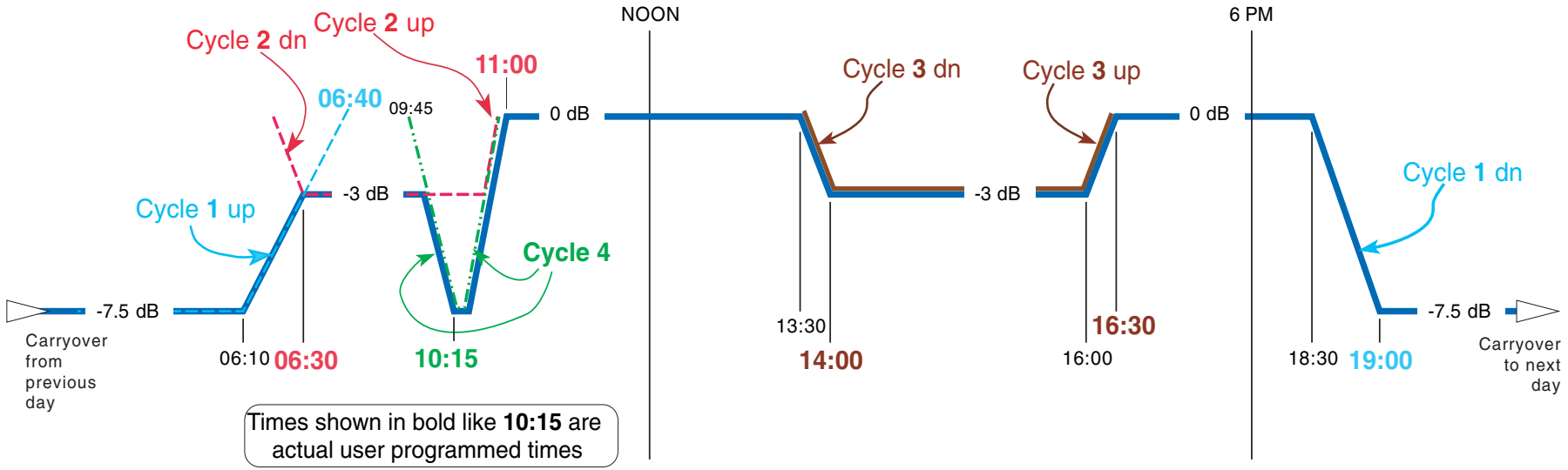
If you're going to make major changes to the factory program, you may want to wipe the programming entries clean to make sure all of the programmed numbers are *your* numbers.

Unlock the system and set DATE to Jan 1 '91.

Unlock clue: Left... Left... ↑ & ↓ for 2 sec.

Enter the information by pressing the → key until all display elements brighten.

LOCK the memory by pressing the ↑ & ↓ keys simultaneously. Locking memory on 1-1-91 zeroes all of the programming registers so you can start out fresh as soon as you unlock.



Times shown in bold like **10:15** are actual user programmed times

Program required to produce the end result curve shown by the **heavy blue** line.

Cycle 1	Up	**06:40**	Dn	**19:00**	30 min.	7.5 dB	All days same
Cycle 2	Up	**11:00**	Dn	**06:30**	30 min.	3.0 dB	All days same
Cycle 3	Up	**16:30**	Dn	**14:00**	30 min.	3.0 dB	All days same
Cycle 4	Up	**11:00**	Dn	**10:15**	30 min.	7.5 dB	All days same

See manual pages 5 and 8 thru 10 for programming details.

How the TIME OVERLAYS work

When time curves overlap, the curve having the most attenuation dominates.

Cycle 4 is an example.

Cycle 4 adds attenuation to cycle 2 beginning at 09:45 (30 minutes before 10:15).

Because cycle 2 is already at -3 dB, nothing happens until cycle 4 gets to about 09:58 when it crosses the cycle 2 curve and then it adds attenuation until it reaches -7.5 dB at 10:15.

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LIMITED WARRANTY

All LynTec products are warranted to be free from defects in workmanship and materials for a period of 15 months from the original invoice date.
Warranty status may be found on the serial number label which shows the warranty expiration date. This warranty shall be limited to the repair, adjustment and/or replacement of defective parts.

LynTec will repair or replace defective LynTec products only at the factory. (see web site for current customer service shipping address) Please call LynTec for RMA number — 800-724-4047.

All returns are to be prepaid. LynTec will pay return UPS surface freight charges within the continental United States on warranty repairs. All customs expenses and excess transportation charges will be borne by the customer.

LynTec will not be responsible for inconveniences or consequential damages occasioned by LynTec equipment, or by breach of any express or implied warranty with respect thereto.

Implied warranties on this product shall be in effect only for the duration of the express warranty set forth above. After the warranty expiration date shown on the serial number label, there shall be no warranties, express or implied on the product.

This warranty becomes void if the product shows evidence of mishandling, tampering, battery or chemical corrosion, fire, water or lightning damage or other acts of nature, use contrary to the applicable instruction manual, shipping damage or repair performed by others.