AD-500/600 ACOUSTIC DETECTOR, version 5.3

Installation instructions

Order. No: AD-500, 13095; AD-600, 13091

Swedish patent No: 9201493-5 British patent No: 0659329

The installation instructions for the AD-500/600 detectors are comprehensive. Among other things they provide detailed descriptions for their operation, installation and adjustment. They also provide a number of application examples that can be used when installing in similar situations. For more applications, see the manual “Energy-saving detection technology” or the “planning guide” at www.extronic.se.

Note! AD-500/600 is supplied pre-programmed with standard settings and is ready for immediate use in standard application. The standard settings and jumper positions are shown on page 5. When installing as part of a standard system it is normally only necessary to adjust the switch-off delay and the sensitivities of the LF/HF ranges (see pages 6 & 7).

Important! Presence detector installation is not complete until the run times and lighting levels have been entered on the form provided for this purpose. The “Dynamic light control” form can be downloaded from www.extronic.se under Presence detection/Documentation/Manuals. Measurements should be made at the premises for at least one week of normal use and then compared with run times before installation. To make this easier there is a form for recording measurement results at the end of this manual, together with a calculation sheet for working out energy savings.

Contents

Technical specifications

Voltage:	230 VAC	Dimensions AD-500 (B x H x D):	223 x 140 x 76 mm
Current drain:	Max. 9 VA/5 VA without external load.	AD-600:	105 x 90 x 75 mm (6 modules) (Standard enclosure for installing in
Max. load:	250 V/5 A resistive load per relay output.		DIN rack).
We recommend that contactors are always used to control light fittings.		Colour AD-500: AD-600:	White Grey

Description

The AD-500 and AD-600 are presence detectors designed **for energy-saving lighting control.**

The detector listens to sounds in two different frequency ranges and analyses them to detect presence. The lighting is switched on by the inaudible low-frequency (LF) sound that is produced when a door is opened. The lighting is then kept switched on by higher frequency (HF) sounds of footsteps, speech and other noises that indicate presence.

The main function is automatic switching on and off of lighting when people are present and when the premises are empty. Lighting can be switched on and off using two separate channels, A and B (lighting groups) with different timer functions.

Applications

Because the AD-500 and AD-600 are acoustic detectors, they can hear “around corners” and in rooms with furniture that acts as a screen. This makes them especially suitable for **stairways, changing rooms with cabinets and aisles, shower rooms, corridors that turn corners, garages, public toilets, storage premises**, and much more. The main requirements are that the **premises are enclosed** and access is gained by **opening a door**.
Each application requires evaluation of sound levels and acoustics.

The acoustic detectors supplement presence detection with passive IR detection, and make it possible to control lighting in premises where it would not be technically feasible or economically justifiable to control lighting with other detection methods.

Two versions

The detector is available in two versions: **AD-500** and **AD-600**.
AD-500 has a built-in microphone and can work independently. It requires a 230 VAC supply. The housing has a DIN rack with space for five modules (90 mm), such as a contactor, which may be required for controlling fluorescent light fittings.

AD-600 has a standard plastic enclosure for mounting in a DIN rack. Because the AD-600 is installed in a control cubicle at least one external microphone must be connected.

Additional microphones can be connected to the AD-500/600 (max. six AD-260, see page 3), as well as IR detectors (e.g. PD-2200), pushbuttons, light sensors, timers, etc. The AD-500/600 also has a 12 VDC output to supply external detectors, etc.

Microphones

There are two versions of microphone: AD-260P and AD-260U.
AD-260P has a sheet metal enclosure for surface mounting.
AD-260U has a plastic enclosure for surface mounting or recessed mounting. It fits standard electrical housings.
The sensitivity of the microphones to HF and LF ranges can be adjusted independently.

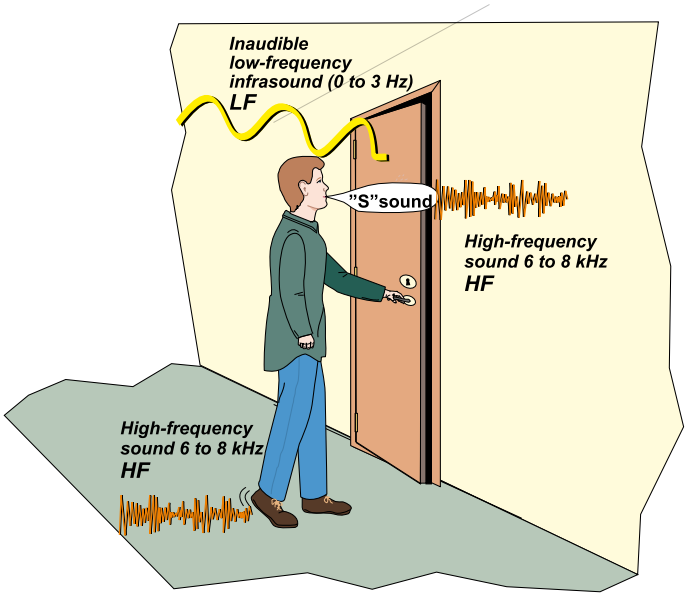
NOTE! Version 5.3 of the AD-500/600 must be used with version 5.0 or later of the AD-260 microphones.

Operation

The detector listens in two different frequency ranges:

The first frequency range, **LF** (low frequency), is inaudible to the human ear and is generated when a door is opened or closed. This low-frequency sound is used to switch on the lighting. Often this happens even before the door has opened more than a few centimetres. In other words you do not realise that the lights were switched off before you entered the premises.

The second frequency range, **HF** (high frequency) includes the sound of footsteps, human speech (especially the S sound) etc. The detector recognises these sounds as human presence. The lighting remains lit as long as sound of this type is detected. HF sound can also switch on the lighting.



Blocking functions

Sometimes you may **not want lighting to be switched on automatically**. A light sensor or timer can be used to prevent one or both channels from switching on lights. The “**HF BLOCK**” jumper can be used to block HF activation alone, if there is high-frequency interference, for example. It is also possible to activate one channel with a pushbutton and the other automatically.

Pushbutton functions
There are two inputs for pushbuttons. A variety of functions can be selected for these inputs; see page 4.

Function settings (see also page 9.)
Five different function settings can be selected for different premises:

1 AREA STANDARD: One or two lighting groups in premises. Used for “Dynamic lighting control”.

1 AREA EXTRA: One or two lighting groups in premises. A and B operate independently. They can be switched on or off independently using pushbuttons.

TOGGLE: Equal distribution of lighting time between two lighting groups.

2 AREAS: Lighting control in two premises.

TOGGLE EXTRA: Toggle function for older fluorescent light fittings. Allows the minimum switch-on time for a lighting group to be limited.

Detection range

The physical detection range varies depending on the acoustic conditions. The detector works best in enclosed premises where access is through doors. It is possible to use a single microphone for detection in a stairway covering five floors. Additional microphones can be connected to cover more floors.

Specification and placement

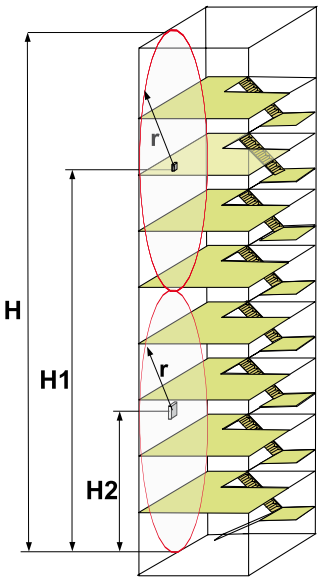
For optimum performance it is important that the detector and additional microphones are correctly placed. In some cases it may require trial and error to determine where detectors and microphones should be placed and how many microphones are need for optimum performance. It is a good idea to test the acoustic conditions by placing a single powered detector in the premises and then checking the response by watching the “HF” and “LF” indicator diodes. In many cases real-life tests are more valuable than theory.

Calculation model for placement of two microphones in a high stairway:
H1 = 3 x r H2 = 1 x r
r = radius of detection area

r = H ÷ 2 x Number of microphones

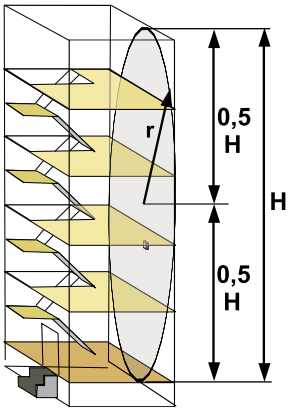
Number of microphones = *H ÷ 2r*

H = the total height of the premises to be monitored (or length, depending on layout of premises).
H1 and H2 = position of microphone/detector.



Example: AD-500 and single AD-260 microphone installed in a stairway.
(See diagram “Placement of two...”.)
H = 24 m
r = 6 m
H1 = 3 x 6 = 18 m
H2 = 1 x 6 = 6 m

Note! A similar calculation can be used to determine the horizontal placements of microphones in a corridor, for example.



Installation advice

See also the **application examples** at the end of this manual!

Interference

Stairways that are used as emergency exit routes often have steel doors into other premises. To get the best performance and prevent interference caused by low-frequency infrasound from doors outside the stairway, steel doors should be checked especially closely.

Try each door when it is closed. If it moves or rattles a little when the door is locked, pressure changes in other areas can trigger the detector. It is recommended that a simple draught-proofing strip is fitted to take up any gap. The most important thing is that the door cannot move and act like a giant diaphragm.
In the case of emergency exit stairways with relatively small volume in relation to their height, good performance can be achieved without the need for an additional microphone. Try it and see!

It is important that automatic door closers in neighbouring areas are also checked. Doors must not shut so suddenly that they bang. This can generate intense infrasound that can cause spurious detection. Even doors in areas that are not directly linked to the detected area, such as lift doors, can affect the detector.

Checking sensitivity

It is a good idea to check that the sensitivity is not set too high by opening and closing exterior doors and doors in the main stairway, etc. If you are unsure whether the detector is being affected by high-frequency or low-frequency interference you can check by temporarily disconnecting one channel or the other while continuing to measure the run time. This lets you determine whether it is the HF or LF sensitivity that needs to be reduced to improve performance.

Documentation

Installation should always conclude with a report that gives the final settings and the run time before and after installation. This information is obtained by measurement with a run time meter (silent) or “Mitsubishi” test unit (gives both run time and number of times lighting is switched on). A “Form for trimming and evaluating presence-controlled lighting using the AD-500 or AD-600” is enclosed at the end of this manual.

In systems with “Dynamic lighting control”, energy measurements should be made before and after installation.

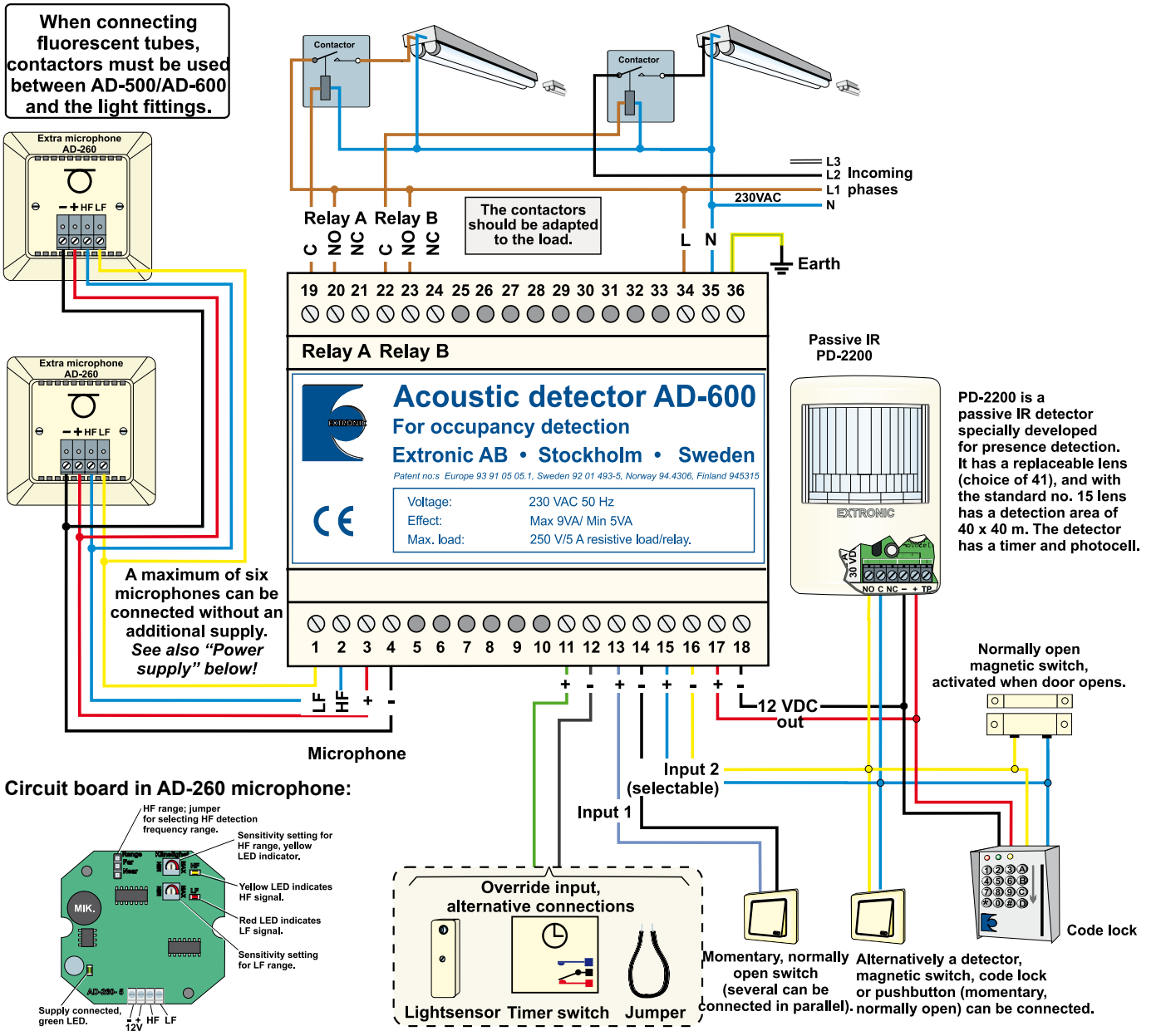
A form for “Dynamic lighting control” can be downloaded from www.extronic.se under **Presence detection/Documentation/ Manuals.**

Connection

Connections to a 230 VAC supply and to microphones, pushbuttons, detectors, etc., are shown in the wiring diagram below.
NOTE! When connecting an external microphone, if there is no supply voltage at the external microphone terminal block on the AD-500/600, first check the fuse for the external supply. This is located on the lower board of the AD-500/600, see photo below.

The blocking input can be used for connecting a light sensor, jumper or a timer to limit the switching on of lighting.
Pushbuttons that are connected to inputs 1 & 2 must be spring-loaded, momentary and normally open.
The relay outputs are intended to supply 230 V contactors for lighting, not lighting loads.

NOTE! The contactor control solution shown below is not ideal. See applications 2 and 3 under “Dynamic lighting control” and dimmable HF ballasts on pages 13–16.



NOTE! Version 5.3 of the AD-500/600 must be used with version 5.0 or later of the AD-260 microphones.

Power supply

The maximum external load that the detector can supply (microphones, IR detectors, etc.) is a total current demand of 150 mA.
NOTE! In the event of overload the automatic fuse for the external power supply will trip. This is located on the lower board of the AD-500/600. Rectify the fault.
The fuse is reset by disconnecting the supply from the AD-500/600 for 10 seconds.

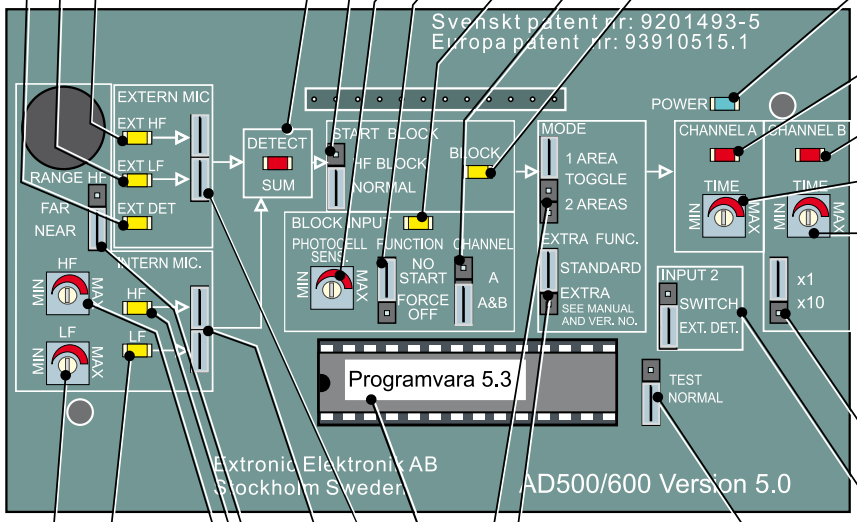
Prepare a current budget for each application!

The AD-260 microphone uses 22 mA.
The PD-2200 IR detector uses 25 mA.

If ancillary equipment requires more than 150 mA, a separate power supply must be added to the system. An EXE-2000 rectifier (order no. 18108) is recommended. The negative terminal on the EXE-2000 is connected to the negative terminal on the AD-600. The positive terminal must not be connected.

Setting up

On the upper circuit board of the detector there are status LEDs, jumpers for selecting functions and potentiometers for adjusting sensitivity and times.



EXT DET: LED (yellow), indicates activation of external IR detector, magnetic switch, etc.

EXT LF: LED (yellow), indicates LF sound detection by external microphone.

EXT HF: LED (yellow), indicates HF sound detection by external microphone.

DETECT: LED (red), lights up when presence is detected.

START BLOCK: jumper that blocks HF start.

PHOTOCELL SENSE: sensitivity adjustment for light sensor.

FUNCTION: jumper that determines function of blocking input. *This jumper should NEVER be placed in the FORCE OFF position when a photocell is used!*

BLOCK INPUT: LED (yellow), lights up if the blocking input is active.

CHANNEL: determines which channels the blocking input activates.

BLOCK: LED (yellow), lights up when signal is blocked.

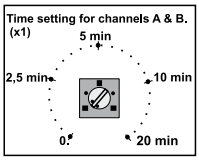
POWER: LED (green), lights up when supply voltage is connected.

CHANNEL A: LED (red), lights up when relay A is closed.

CHANNEL B: LED (red), lights up when relay B is closed.

TIME A: switch-off delay, max. 20 min.

TIME B: switch-off delay, max. 20 min. (200 min. with * 10)(function varies depending on programming).



JUMPER CHANNEL B: selection of timer interval for TIME B, max. 200 min.

INPUT 2: jumper for selecting function of input 2, terminals 15 & 16 (pushbutton or detector).

EXTRA FUNC: jumper for connecting additional functions.

MODE: jumper for selecting function mode.

Microprocessor with version number.

TEST/NORMAL: jumper for selecting short fixed times for testing/adjustment. *NOTE! In normal use this jumper should <u>always be in the "NORMAL" position.</u>* Otherwise times will be reduced to a few seconds regardless of the setting of the "TIME" potentiometers.

EXTERN MIC: jumper for connecting external microphone.

Only with AD-500

LF: LED (yellow), lights up when internal microphone detects LF sound.

LF: adjustment of sensitivity of internal microphone to LF sound.

INTERN MIC: jumper for connecting and disconnecting nternal microphone.

RANGE HF: jumper for selecting frequency range of HF sound detection.

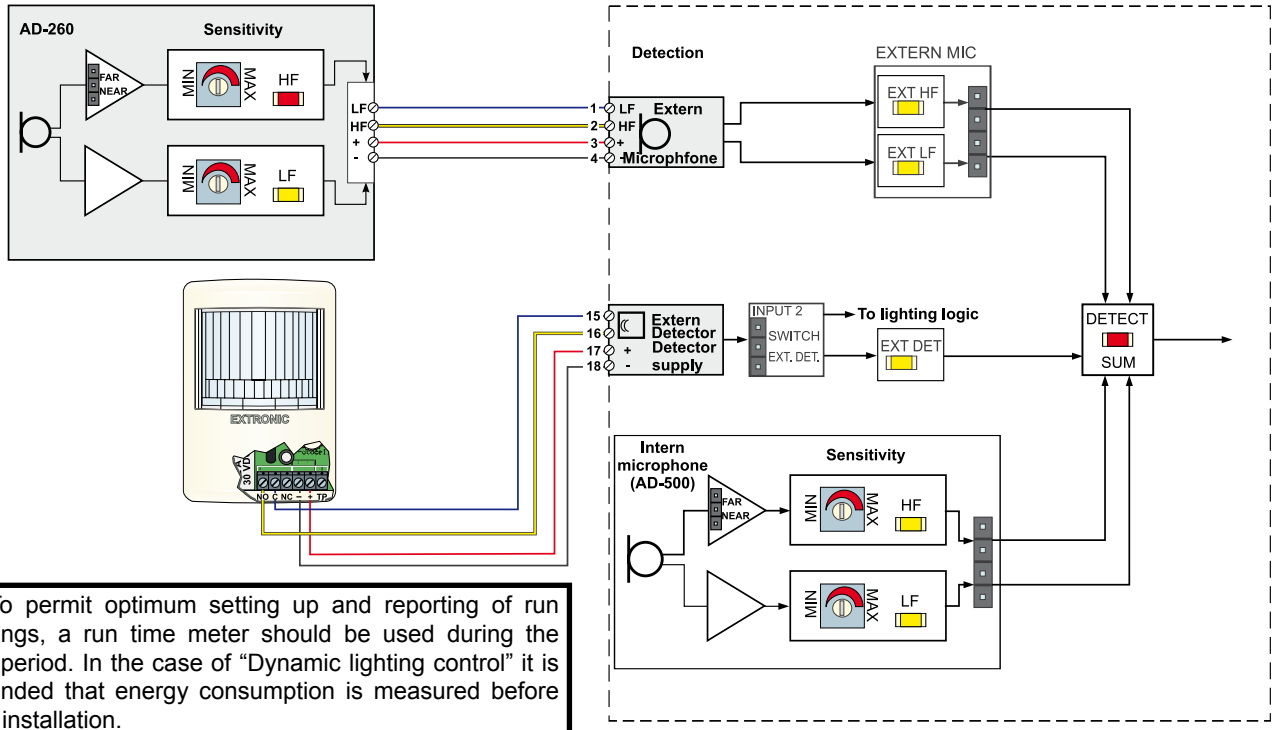
HF: LED (yellow), lights when internal microphone detects HF sound.

HF: adjustment of sensitivity of internal microphone to HF sound.

Standard programming = positions of programming jumpers

The diagram shows the detector as supplied with standard programming. NOTE! The jumpers "RANGE HF" and "INTERN MIC" are only present in the AD-500.

Setting up HF and LF detection



NOTE! To permit optimum setting up and reporting of run time savings, a run time meter should be used during the trimming period. In the case of “Dynamic lighting control” it is recommended that energy consumption is measured before and after installation.
A suitable run time meter is the BW-7, order no. 19178.

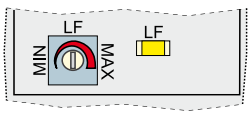
It is assumed that installation is complete and the supply and load are connected. Adjustment of sensitivity should only be carried out on one channel at a time (LF or HF) according to the following procedure.

Start by adjusting the LF channel that controls the lighting. Disconnect the HF channel for the microphone to be adjusted, and disconnect any additional microphones entirely.
When adjusting an additional microphone, disconnect the built-in microphone (in AD-500) and any other additional microphones. If you need to disconnect one or more additional microphones, do so at each microphone’s terminal block. All additional microphones can be disconnected using the jumper in the main unit. See “Disconnecting Internal/External microphone”, on page 7.

LF adjustment

LF sound is low-frequency sound (infrasound) that is generated when doors are opened or closed indoors, and by thunder, aircraft, strong wind, etc. The detector is especially sensitive to LF sound from the opening and closing of doors. Different doors in different premises generate LF sound of varying intensity.
Large doors generate louder LF sound than small doors. Doors that open on to large rooms generate louder LF sound.
An exterior door therefore generates more LF sound than the door of a cleaning cupboard.

The LF potentiometer

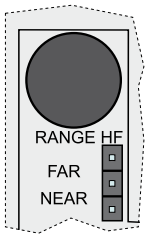


(in AD-500 or AD-260) is used to adjust the sensitivity to low-frequency infrasound (frequencies below 5 Hz). Get someone to enter the premises repeatedly through the door that is smallest and furthest away, and gradually increase the LF sensitivity. Stop increasing the sensitivity when reliable detection is achieved. Wait at least 10 seconds between each test to allow the electronics to stabilize. Then try other doors in the premises and fine-tune if necessary.

HF adjustment

HF detection reacts to audible sound from a few kHz up to 25 kHz. This includes speech, especially the “S” sound, The detector is specially designed to detect human speech and the sounds people make as they walk.

Frequency range

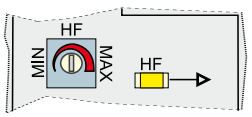


Sound is affected by distance. Low-frequency sound is damped less than high-frequency sound. The **FAR/NEAR** jumper can be used to select the frequency range used for HF detection.

With the jumper in the **NEAR** position the detector detects sound that does not spread very far. With the jumper in the **FAR** position it detects sound that can travel further, including sound that may pass through doors. Where possible, **the jumper should therefore be kept in the NEAR position**.

Sensitivity

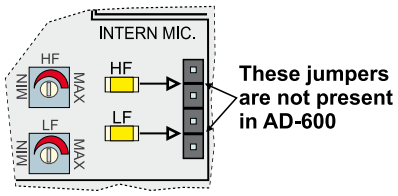
The HF potentiometer is used to set the sensitivity of the internal microphone (AD-500) to high-frequency sound. **Set the sensitivity as low as possible, but high enough so that normal sounds are detected in the premises**. Test to ensure that HF sound from neighbouring premises is not detected.



You should also consider the option of ignoring HF sound before LF sound is detected. See “Blocking HF start” on page 8.

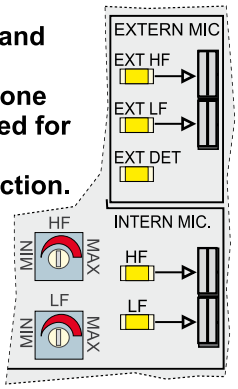
Disconnecting Internal/External microphone

The bypass jumpers INTERN MIC LF & HF and EXTERN MIC LF & HF can be used to disconnect internal and external microphones.

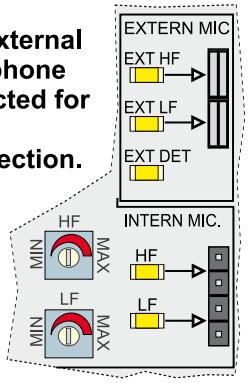


The "INTERN MIC" and "EXTERN MIC" jumpers are only provided in the AD-500.

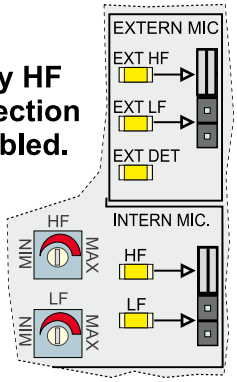
Internal and external microphone connected for LF and HF detection.



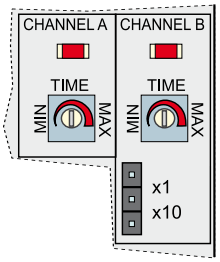
Only external microphone connected for LF and HF detection.



Only HF detection enabled.



Timer settings



Timer A (channel A) can be set from around 3 sec. to 20 min.

Timer B can be set from around 3 sec. to 200 min. Time range is set with a jumper. The timer setting has different functions depending on the working mode of the detector.

Switch-off delay

In principle you should **set the time as short as possible** to achieve the best possible energy saving.

The following example can act as a guide. Assume that it takes one minute and 15 seconds to enter a stairway, climb to the third floor and enter an apartment. You should therefore choose a detector time of, say, one minute and 30 seconds.

In this case the light will not go out even if you move so quietly that you are not detected again after entering the stairway. It is likely, however, that the microphone will detect a door (lift door) opening again, or addition HF sound (such as footsteps). The time will then be extended by a maximum of one minute and 30 seconds and the lights will remain on for the duration of your passage through the stairway.

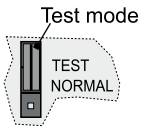
This example gives an optimum setting that is suitable for use with incandescent **bulb lighting, low-voltage lighting, halogen lighting** and other light sources that can cope with intermittent operation. **Fluorescent tubes** can be operated in various different ways with varying tolerance to intermittent operation.

Acoustic detectors can often be used to give better energy savings than the limitations of the light sources normally allow.

Study the section on **"Dynamic lighting control"** and the relevant application examples in the manual "Energy-saving detection technology" or on our website at www.extronic.se.

Always choose dimmable HF ballasts in premises where people pass many times each day.

Test/setup mode



To make it easier to test and set up the system, the detector can be switched to test/setup mode. This is done with a jumper and shortens the timer functions to fixed times of a few seconds.

NOTE! During normal use the jumper should always be in the "NORMAL" position. Otherwise the times will be reduced to a few seconds regardless of the settings of the "TIME" potentiometers.

Blocking HF start

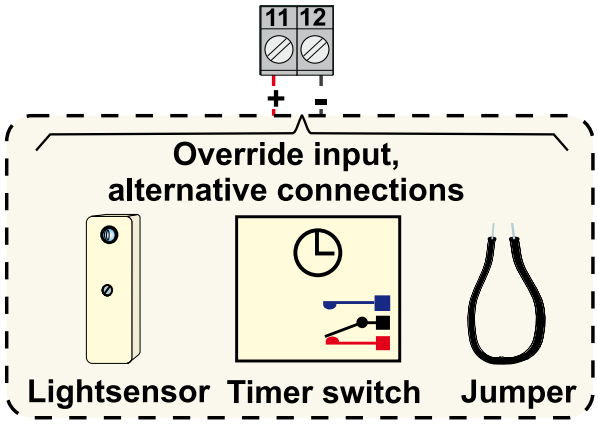
In special cases where regular audible interference may arise, the detector can be programmed to ignore audible sound under certain conditions.

If the **START BLOCK** jumper is moved to **HF BLOCK** the detector totally ignores audible sound when someone enters. It is only when LF sound has been detected as a result of a door opening that HF detection is enabled. This then keeps the lighting switched on until no sound is detected and the set time has elapsed. HF detection is then blocked again.

Example in a bus garage: In winter buses drive in carrying a lot of snow. When large lumps of snow melt and fall to the concrete floor they triggered the lighting. Using the blocking function this false triggering could be eliminated.

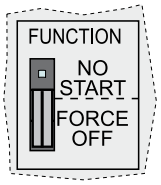
Blocking functions using blocking input

The functions described below are activated using the blocking input, terminals 11 & 12.
The blocking input is used to prevent lighting from being switched on, or to switch off lighting. A light sensor, jumper or timer can be connected to the blocking input.
The BLOCK INPUT LED indicates when the blocking input is active.



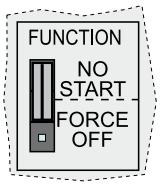
Blocking function

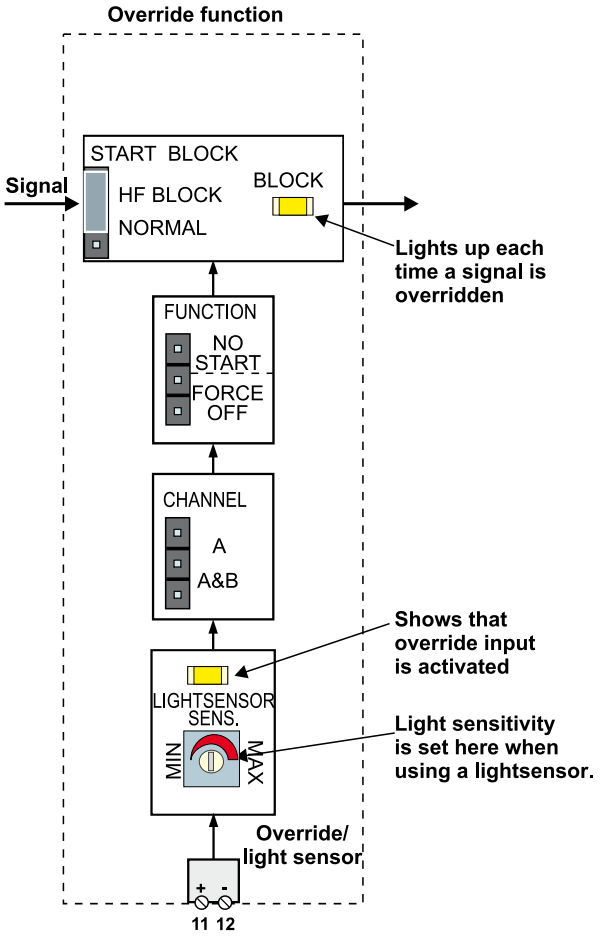
NO START means that the blocking input blocks automatic switching on when presence is detected. A pushbutton must be used to switch on the lighting. If the blocking input is activated after the detector has switched on the lighting it will not affect the operation of the detector. This means that a light sensor that is illuminated by the light fittings can be located in the premises without switching off the lighting.



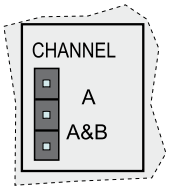
Blocking function

FORCE OFF means that the blocking function switches off the lighting immediately. The lighting cannot be switched on as long as the blocking input is active.
A light sensor must NEVER be placed in premises where FORCE OFF is used!



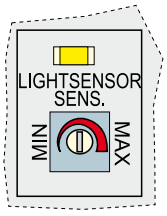


The **CHANNEL** jumper can be used to select whether you want just one channel (A) or both channels (A & B) to be activated by the blocking input. If the **TOGGLE function** mode is used it blocks channel A or channel B whenever the jumper is in position “A”.



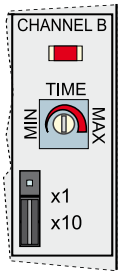
Light sensor

The **light sensor SENSE** potentiometer can be used to adjust the sensitivity of a light sensor that is connected.
The light sensor used must be Extronic’s LS-10 light sensor, order no. 13100.



Light sensor and “Dynamic lighting control”

For “Dynamic lighting control” it is necessary to use function mode **1 AREA STANDARD**, with the jumper for **TIME, CHANNEL B** placed in the x10 position.
When the lighting is set to low power and there is still sufficient light in the premises, Timer B will start to count down regardless of whether anyone is present.



When timer B has completed counting and no presence is detected (sound + timer A) the low-level lighting will be switched off completely.
The lighting will not be switched on until the light sensor detects that it is too dark.

Example: In a stairway fitted with an AD-500/600, the lighting is switched off in the afternoon when there is sufficient light, even when people use the stairway at various times.

Function modes

AD-500/600 has several function modes to suit different types of premises. The function modes change the functions of pushbuttons, blocking inputs, external detector inputs, LF/HF detection, timer functions and lighting logic.

1 AREA STANDARD

This function mode can control one or two lighting groups in a single area, or in a “Dynamic lighting control” system in combination with a level selector.
When presence is detected, channels A and B are activated. When presence is no longer detected, timer A first starts counting down, and when it is complete timer B starts counting down.

Time A:

When timer A has finished counting, relay A opens and only relay B remains closed.
In a “Dynamic lighting control” system, timer A determines the switch-off delay for the high lighting level.

Time B:

Timer B starts counting when timer A has finished counting. When timer B has finished, relay B also opens.
In a “Dynamic lighting control” system, timer B determines the switch-off delay for the low lighting level.
The x10 jumper can be used to set timer B for a maximum of 200 minutes.

See application example on page 12.

1 AREA EXTRA

This function mode is intended for controlling **one or two lighting groups** in a single area. Two lighting groups operate independently.
Time A: This sets the desired switch-off delay for channel A.
Time B: This sets the desired switch-off delay for channel B.

TOGGLE STANDARD

The **Toggle** function mode can be used, for example, in areas where the lighting is shared equally between lighting groups A and B. Toggle standard works in a similar way to 1 AREA STANDARD, but relays A and B change their switch-off sequence each time to ensure uniform light source wear between the two groups. This means that sometimes relay A closes before relay B, and sometimes B before A, not always A first as with 1 AREA STANDARD.
See application example on page 17.

2 AREAS

This function mode is intended for controlling lighting in two different areas, such as men’s toilets and women’s toilets. Channels A and B operate totally independently of each other, depending on presence detection. The AD-500 detector is placed in one area and its microphone controls channel A. One or more microphones placed in the second area control channel B.

TOGGLE EXTRA

This function mode is a variant of Toggle Standard that is specially adapted for upgrading existing premises with older fluorescent tube light fittings. Fluorescent light sources wear out quickly if they are switched off and then switched back on again before they have had a chance to cool down. The life of fluorescent tubes is extended considerably if they are allowed to cool down a little before being switched back on.

In “TOGGLE EXTRA” mode the light fittings are divided into two groups. Both groups are switched on when presence is detected. When presence is no longer detected the first group is switched off after the set time delay (timer A). The second group is switched off after the first group has cooled down for the required time (timer B). The system alternates between switching off group A and group B first.
If you want the fluorescent tubes to cool down for 10 minutes then timer B should be set to 10 minutes.
See application example on page 18.

Lighting logic

The lighting logic in the detector determines the order in which the channels are switched on and off, what the pushbutton inputs should do, which timer function to use, etc. In function modes “1 AREA EXTRA” and “2 AREAS” the lighting logic is independent for channels A and B.

Inputs 1 and 2

Input 1 can only be used as a pushbutton input. An unlimited number of pushbuttons can be connected and used to switch lighting on and off. Depending on which function mode is selected, the inputs may control both channels or channel A alone.

Input 2 can be used either as a pushbutton input or an external detector input. This function is selected with the “INPUT2” jumper, which can be set to either “SWITCH” (pushbutton input) or “EXT DET” (External detector).

The inputs have different functions depending on which function mode is selected. In “1 AREA EXTRA” and “2 AREAS” modes, channels A and B operate independently. Input 1 switches channel A on and off, and input 2 switches off channel B.

In the other function modes the pushbutton inputs control both channels. This means that both channels can be switched on/off with input 1, but with input 2 both channels can only be switched on.

Switch-off delay is the delay until the lighting is switched off after presence was last detected. This time begins again (the timer is reset to zero) each time presence is detected.

Controlling different light sources

Incandescent bulbs

Incandescent light sources (incandescent bulbs) are naturally not the most energy-efficient of light sources, but are despite of this used in many locations, such as fine old stairways and basements and attic walkways that are used infrequently. If incandescent bulbs are used with presence detection the operating times are usually negligible since very short burn times (detector delay) can be used. Incandescent bulbs cope very well with being switched on and off. In more sophisticated systems, presence detection can be used to switch between two dimmer setups that are set for, say, five per cent and 80 per cent. This provides a warm and welcoming base lighting level (five per cent) that switches to a higher level (80 per cent) when someone is present. This will often satisfy the need to have a continuous low light level in a stairway and extend the life of incandescent bulbs by running them at a lower supply voltage.
See also application example 2I (2 India) in the manual and specification guide at www.extronic.se. This example uses halogen bulbs, but also applies to incandescent bulbs.

Halogen bulbs

Halogen bulbs cope with intermittent operation in the same way as incandescent bulbs. See the section above on incandescent bulbs.

Fluorescent tubes with coil ballast

If there is no plan to replace the light fittings with higher efficiency light fittings (with HF ballasts) it will be necessary to follow the light source manufacturer's recommended run times.
Fluorescent tube wear has a direct link to the number of times the lights are switched on.

Where lighting is controlled by presence detection it is also important to use electronic Pulse starters or Strike starters such as those available from "Aura Light". These have a slower preheat and distinct ignition that protects the fluorescent tubes. Because coil ballasts use 20–25 per cent more energy you should always consider light fittings with HF ballasts, especially dimmable ballasts that use a 1–10 V control signal.

Fluorescent tubes with HF ballast (non-dimmable)

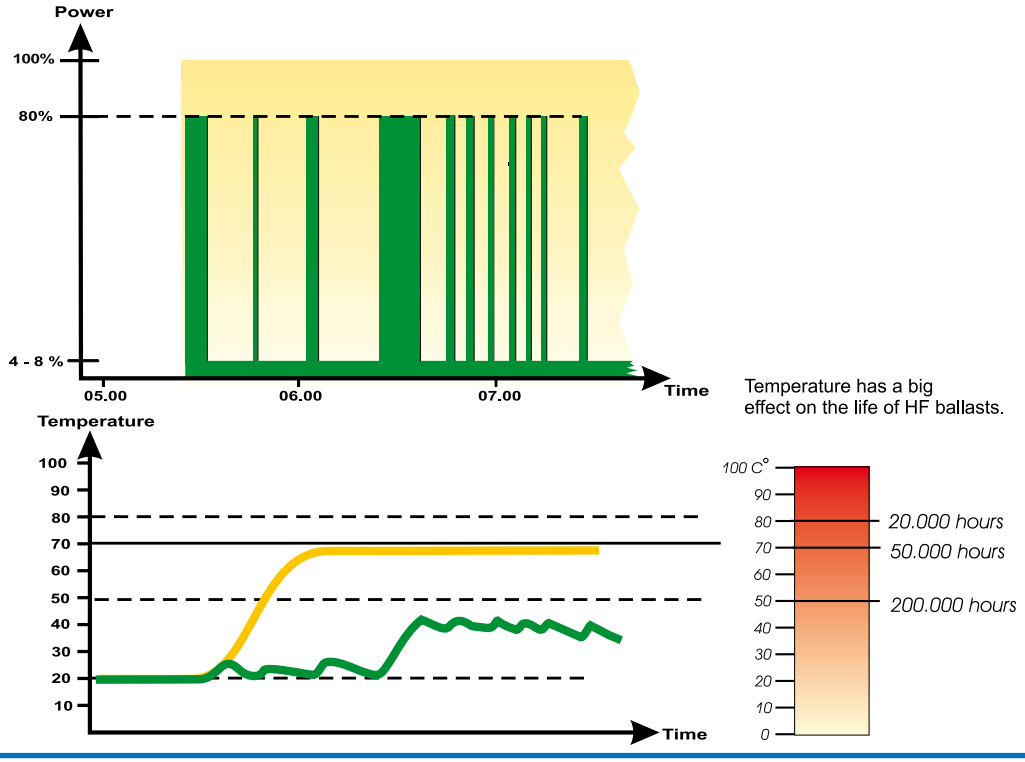
Non-dimmable HF ballasts should carry a large environmental surcharge to encourage with wider use of dimmable ballasts. The use of HF ballasts and light sources that have short lives when operated intermittently (switched on and off frequently) is a problem for the industry.
When using non-dimmable HF ballasts it is necessary to follow the light source manufacturer's recommended minimum burn times, which leads to very high energy consumption and overheating of HF ballasts, and consequently short lifetimes.
The following diagram shows the improvement in energy consumption that can be achieved if dimmable ballasts are used (green curve).

Fluorescent tubes with HF ballast (dimmable)

In new builds and renovation projects it is a serious oversight not to choose light fittings with dimmable HF ballasts. This is also true even if lighting is not to be controlled by presence detection!
The ability to dim lighting allows infinite adjustment of power consumption and reduction of the working temperature, which significantly extends working life. When presence detection is used it permits a number of attractive features and satisfies the need for base lighting without installing additional light fittings that require different maintenance intervals.
See also examples 4B and 1F in the manual or specification guide at www.extronic.se.

Other light sources

Other types of light sources on the market can provide different options for dimming and for switching on and off. Consult your light source supplier!



Dynamic lighting control

Dynamic lighting control means that the lighting is adjusted depending on how the premises are used. Forget timers, timer channels, switch-off signals and building management computers. Let people control the light level by simply being there: switching between base lighting, night lighting and full lighting, or switching the lights off. If the premises are empty for a certain length of time the lighting can be switched off completely.
This technology also allows lighting to be switched on just long enough for people to pass through, without causing additional wear to the light sources.
This means that presence-controlled lighting can be up to 80 per cent more efficient than conventional lighting control methods that switch lighting on and off according to light source manufacturers' recommendations. See the diagram below.

Numerous benefits

Longer life

HF ballasts operate at lower temperature, which greatly increases their life.
By only supplying 80 per cent of the rated power to the light source and ballast, the energy lost by the light fitting as waste heat is reduced by a power of two. This in turn extends the working life considerably, sometimes by a factor of four.
The possibility of short, intermittent operation also helps reduce the working temperature of the light fitting, which significantly extends the life of the HF ballasts.
Reduced wear to the fluorescent coating also extends the practical lifetime. Wear to the fluorescent coating is proportional to the power times the run time. If the light source is only run at 80 per cent power it means 20 per cent longer run time and coating life. In practical terms this can extend the working life by several years.
The number of ignitions per day is greatly reduced, which also extends light source life.

Most of us are familiar with the curve that shows expected life in relation run time. But switching fluorescent tubes off and on frequently drastically reduces their life, and instead of the expected 8,000 hours, we may only get 800 hours.

Gentle base lighting

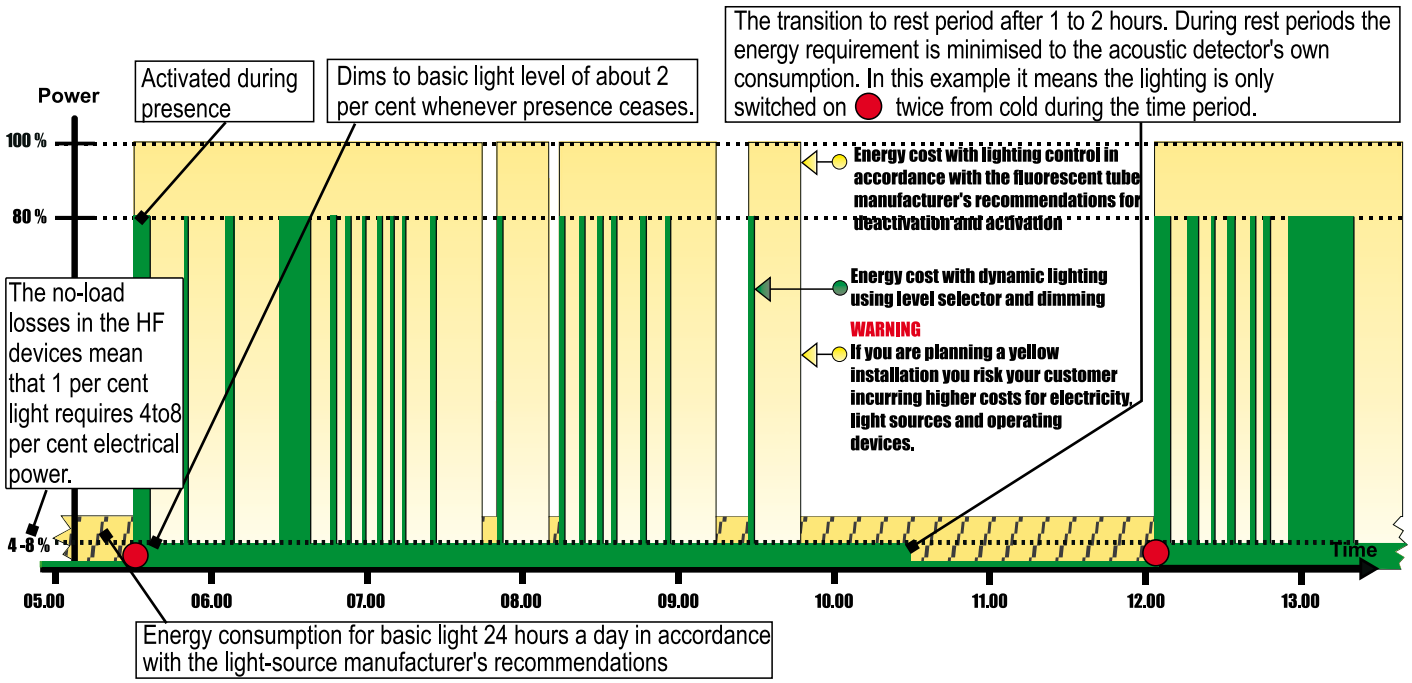
It is possible to achieve uniform, gentle base lighting without additional light fittings and the accompanying additional maintenance.
Having one in ten light fittings in a garage run on full power is an outdated approach – see the yellow curve in the graph below. This creates bright, point source lighting that dazzles the eyes so you perceive it to be dark everywhere except underneath the light fittings that are switched on.

Less maintenance

Having one in ten light fittings run on full power also creates different maintenance intervals for different light fittings in the same area, which means that the system requires two visits during a given maintenance period. Uniformly spread base lighting means uniform wear, and combined with longer life gives a significant increase in maintenance intervals.

Easier for eyes to adjust

Because all the light fittings run at 1–2 per cent power this produces gentle, uniform base lighting that instead dilates the pupils and takes advantage of our physiological response to low light levels to help save energy. When it is dark outside the lighting is dimmed to around a 25-per-cent night light level when presence is detected, which allows people's eyes to adapt more quickly when entering and leaving a garage, for example.
If presence is not detected for an extended period the base lighting is also switched off to reduce idle losses and allow the light fittings to rest. This ensures that the lights are only switched on from cold a few times each day. See the diagram below!



Application examples

Function mode: 1 AREA STANDARD

In applications 1–4 the AD-500/600 is set to function mode “1 AREA STANDARD”. This function mode is designed to control one or more lighting groups in an area. If pushbutton inputs are used they control both channels.

1. Stairway with acoustic detector

50 Hz or dimmable HF ballasts
(Application example 4A in the specification guide at www.extronic.se).
Premises

NOTE! On new builds or renovation projects we recommend that “Dynamic lighting control” is installed. See application example 2, which describes “Dynamic lighting control” in stairways!
This solution should only be used when the light fittings cannot be replaced with light fittings that have dimmable HF ballasts.

A stairway can be considered as closed premises with access through a number of doors. This makes acoustic detection an unbeatable solution, as it is the only method that permits lights to be switched on before people enter the premises.

A stairway can often be regarded as a heavily trafficked area, so the light fittings and control method should be chosen with care. With the right system, detection is generally not a problem, but it is important to consider the best way of controlling the light sources. If you get this wrong it can have unexpected consequences in the form of greatly increased maintenance and wear to light sources and ballasts.

On new builds or renovation projects we recommend that “Dynamic lighting control” is installed. See application example 2. “Stairways with acoustic detectors and dimmable HF ballasts”, which describes “Dynamic lighting control” for stairways!

Light sources
This application shows an example with light fittings that have 50 Hz coil ballasts or non-dimmable HF ballasts. In the case of conventional coil ballasts these should be used with electronic starters (such as AURA Strike) to minimise wear to fluorescent tubes.
Placement of detector
See page 3!

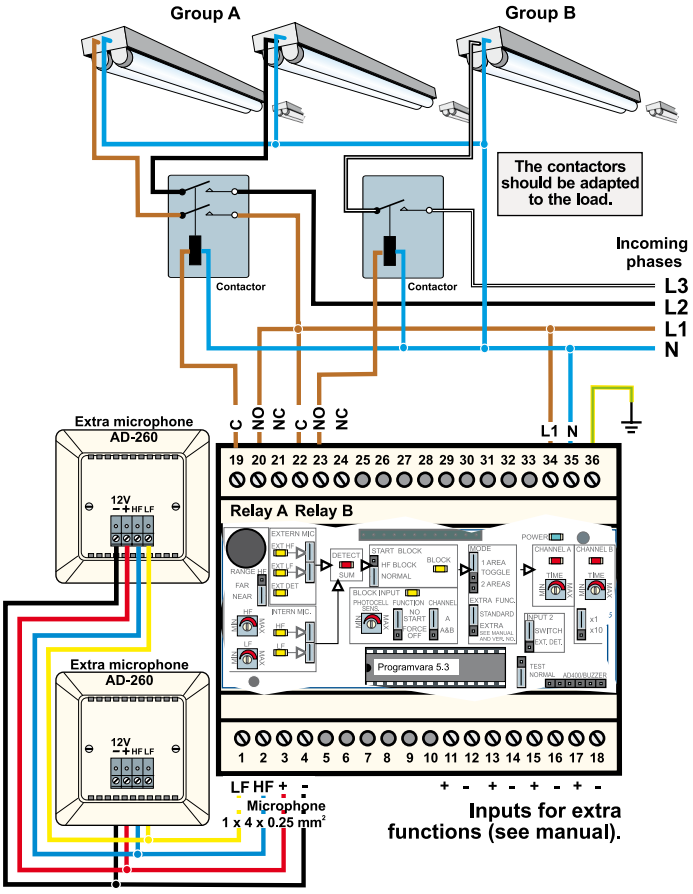
Control system

This example shows a conventional installation with an acoustic detector and two lighting groups with adaptive function.
In the example it is recommended that the load is divided into two groups of two phases and one phase respectively, controlled by channels A and B of the acoustic detector. Group A contains most of the light fittings, and group B contains a smaller number of light fittings that meet base lighting requirements.

When lighting is no longer needed, the first two phases (group A) are switched off after a delay set according to the light source manufacturer’s recommendations (often 10–20 minutes).
If presence is not detected within, says, two hours (e.g. at night) the third phase (group B) is switched off.

This means that the system has an adaptive function and adapts to actual movements on the stairway, so the stairway is not totally unlit during periods of the day when it is used relatively often, since group B at least remains lit.

When the lighting is switched off completely or only group B is lit and someone enters the stairway (a door is opened), both lighting groups are switched on immediately.
The microphones, which are connected in parallel, can be wired using EKKX 1 x 4 x 0.25 mm² cable.



See the detector manual for instructions on adjusting and programming the acoustic detector.

Components required for this application	
Product	**Order no.**
Acoustic detector AD-600	13091
Microphone AD-260U	13106

Alternative component	
Microphone AD-260P	13105

2. Stairway with acoustic detector and dimmable HF ballasts

(Application example 4B in specification guide at www.extronic.se).

Function mode: 1 AREA STANDARD

Premises

A stairway can be considered as closed premises with access through a number of doors. This makes acoustic detection an unbeatable solution, as it is the only method that permits lights to be switched on before people enter the premises.

Light sources

The light fittings on this stairway have dimmable HF ballasts with analogue control (1–10 V).

Control system

In light of experience and technological superiority it would be a serious oversight not to install a “Dynamic lighting control” on new builds or renovation projects where there is the opportunity to choose the ballasts used in light fittings.

This system is described in detail in the manual “Energy-saving detection technology” and the brochure “Dynamic lighting control”. This technology can be used for both acoustic control and control using IR detectors.

NOTE! For acoustic detection it is a requirement that the stairway is closed, i.e. that access to all other areas is through doors that are normally closed.

Operation

When someone enters the stairway corridor the lights are switched on at the normal level set by the “High” potentiometer in the NV-2T level selector, e.g. at around 80 per cent. The lighting is kept at the 80-per-cent level for as long as presence is detected. When presence is no longer detected, and the delay set for relay output A has elapsed, the lighting is reduced to the base level. This is set at around two per cent by the “Low” potentiometer in the NV-2T level selector, so that the stairway corridor does not become completely dark.

If no presence is detected in the stairway for an extended period of one to two hours, which is set as the delay for relay output B, the lighting is switched off completely for the rest period, in order to avoid idle losses. The maximum delay that can be set for relay output B is 200 minutes. See also the diagram on the following page!

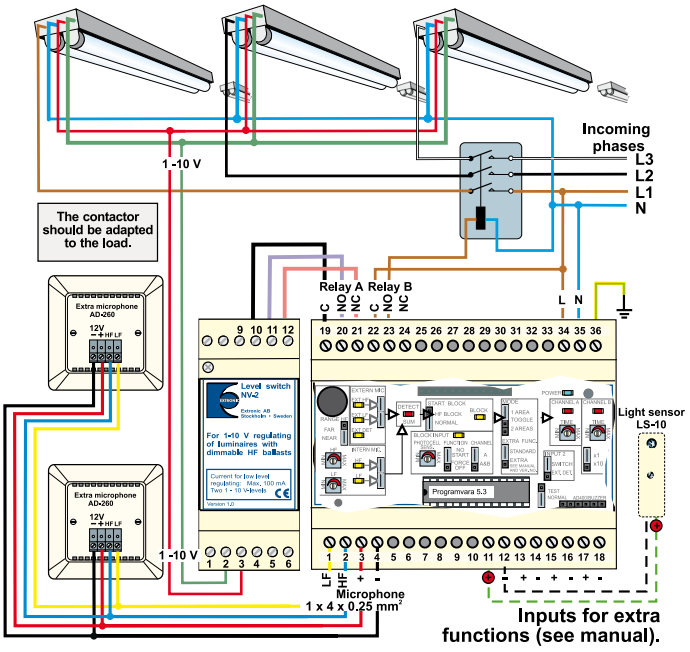
The NV-2T level selector is also available with DSI protocol (NV-2T DSI).
The main benefits of “Dynamic lighting control” are:

- Uniform base lighting without additional light fittings that operate at 100 per cent.
- Potential energy savings of 20–25 per cent during operation.
- Light fittings operate at lower temperature, giving a corresponding increase in life.
- Less frequent switching on and operation at reduced power means less wear to fluorescent coating and corresponding increase in life of light sources.
- No need to follow light source manufacturer’s recommended burn times, which greatly reduces run times and improves savings.

Detector placement

See page 3!

This shows a wiring diagram for “Dynamic lighting control” with acoustic detection. The microphones, which are connected in parallel, can be wired using EKKX 1 x 4 x 0.25 mm² cable.



See the relevant manual for adjustment and programming. See power diagram on following page.

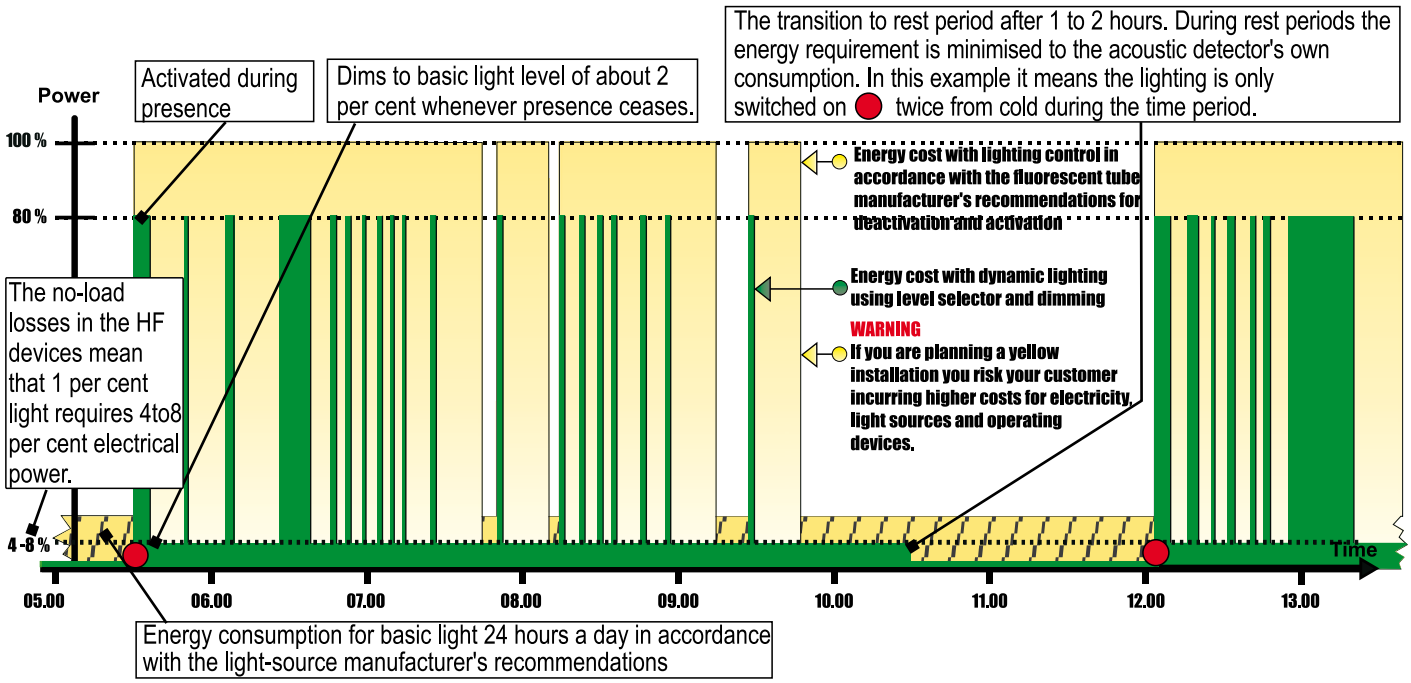
Always record the timer settings and lighting levels for the level selector. This will assist you when maintaining and servicing the installation in the future.
Use the editable pdf form that can be found at www.extronic.se in application 4B of the “Specification guide

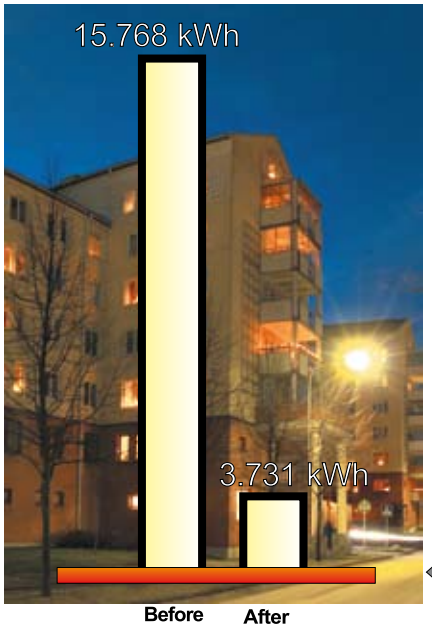
Components required for this application	
Product	**Order no.**
Acoustic detector AD-600	13091
Microphone AD-260U	13106
Level selector NV-2 (1-10 V)	13168

Alternative components	
Microphone AD-260P	13105
Level selector NV-2 DSI	13169A
Light sensor LS-10	13100

“Dynamic lighting control” in stairway
The yellow area represents the energy consumption with conventional lighting control according to the light source manufacturer’s recommended burn times.

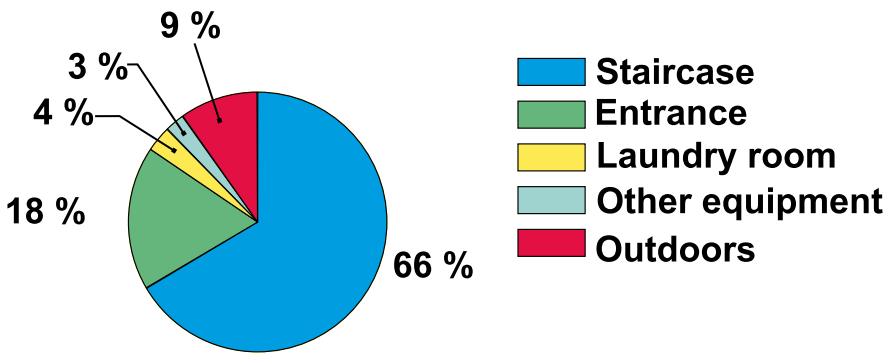
The green area represents the energy consumption with “Dynamic lighting control” installed. The yellow area is the unnecessary energy cost!





Electricity consumption in stairwell in Housing Association TRANAN, Bromma before and after installation of dynamic lighting.

The cost distribution for electricity in general areas in multi-dwelling buildings (not in garages and flats).

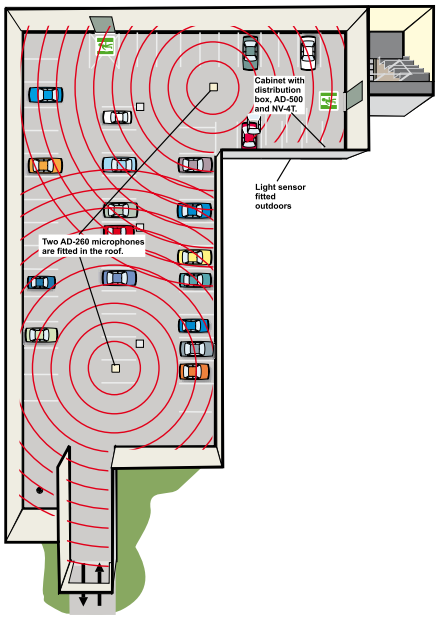


3. Enclosed garage with acoustic detector

Dimmable HF ballasts with daylight-dependent “Dynamic lighting control” and four lighting levels.

(Application example 1F in specification guide at www.extronic.se).

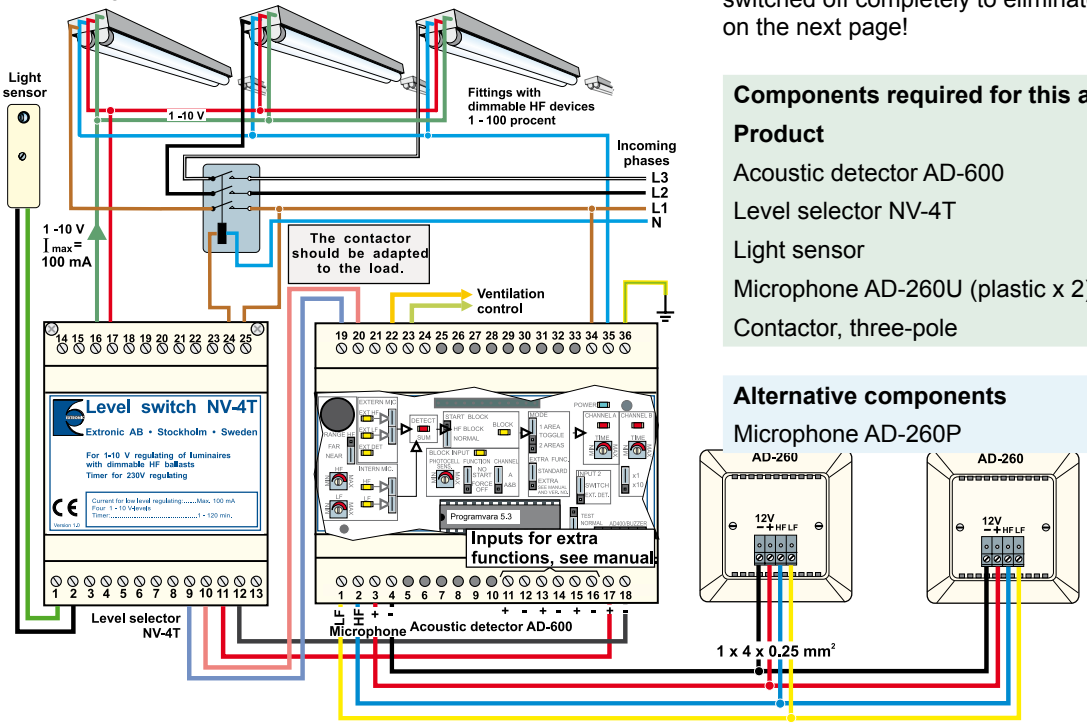
Function mode: 1 AREA STANDARD Premises



In a closed single-storey garage, acoustic detection is an unbeatable solution, as it is the only method that permits lights to be switched on before people enter the premises. For open garages, such as multi-storey car parks, see the section on IR detector applications.

Placement of detectors and microphones

This example shows a conventional installation with acoustic detector. Note the placement of the microphones with up to twice the normal radius between them. The range of the microphones can be up to 20–25 metres depending on acoustic conditions. Ceilings with acoustic panels can reduce the range of the HF signal. The microphones, which are connected in parallel, can be wired using EKKX 1 x 4 x 0.5 mm² cable.



Light sources

The light fittings in this garage have dimmable HF ballasts with analogue control (1–10 V).

Control system

On new builds or renovation projects, where there is the opportunity to choose light fittings with dimmable ballasts, the installation should basically follow the principle of daylight dependent “Dynamic lighting control”. This is described in detail in the section on “Dynamic control”. This method can be used for control with either acoustic or IR detectors. In combination with the NV-4T, dimmable fluorescent tubes can be controlled with up to four light levels.

The main benefits of “Dynamic lighting control” are:

- Uniform base lighting without additional light fittings that operate at 100 per cent.
- Potential energy savings of 20–25 per cent during operation.
- Light fittings operate at lower temperature, giving a corresponding increase in life.
- Less frequent switching on and operation at reduced power means less wear to fluorescent coating and corresponding increase in life of light sources.
- No need to follow light source manufacturer’s recommended burn times, which greatly reduces run times and improves savings.

A light sensor allows the NV-4T to switch lighting between a “daylight” programme and a “night time” programme. When presence is detected during the day the light level is adjusted to around 80 per cent, and after dusk falls the level is reduced to around 30 per cent when people are present. This allows people’s eyes to adjust more easily to the light when entering and leaving the garage when it is dark. It also means an energy saving of around 20 per cent when the lighting is on during the day and around 70 per cent at night. When no one is present (during the day and night) the lighting is first reduced to around two-per-cent base lighting, and after 1–2 hours the lighting is switched off completely to eliminate idle losses. See the diagram on the next page!

Components required for this application

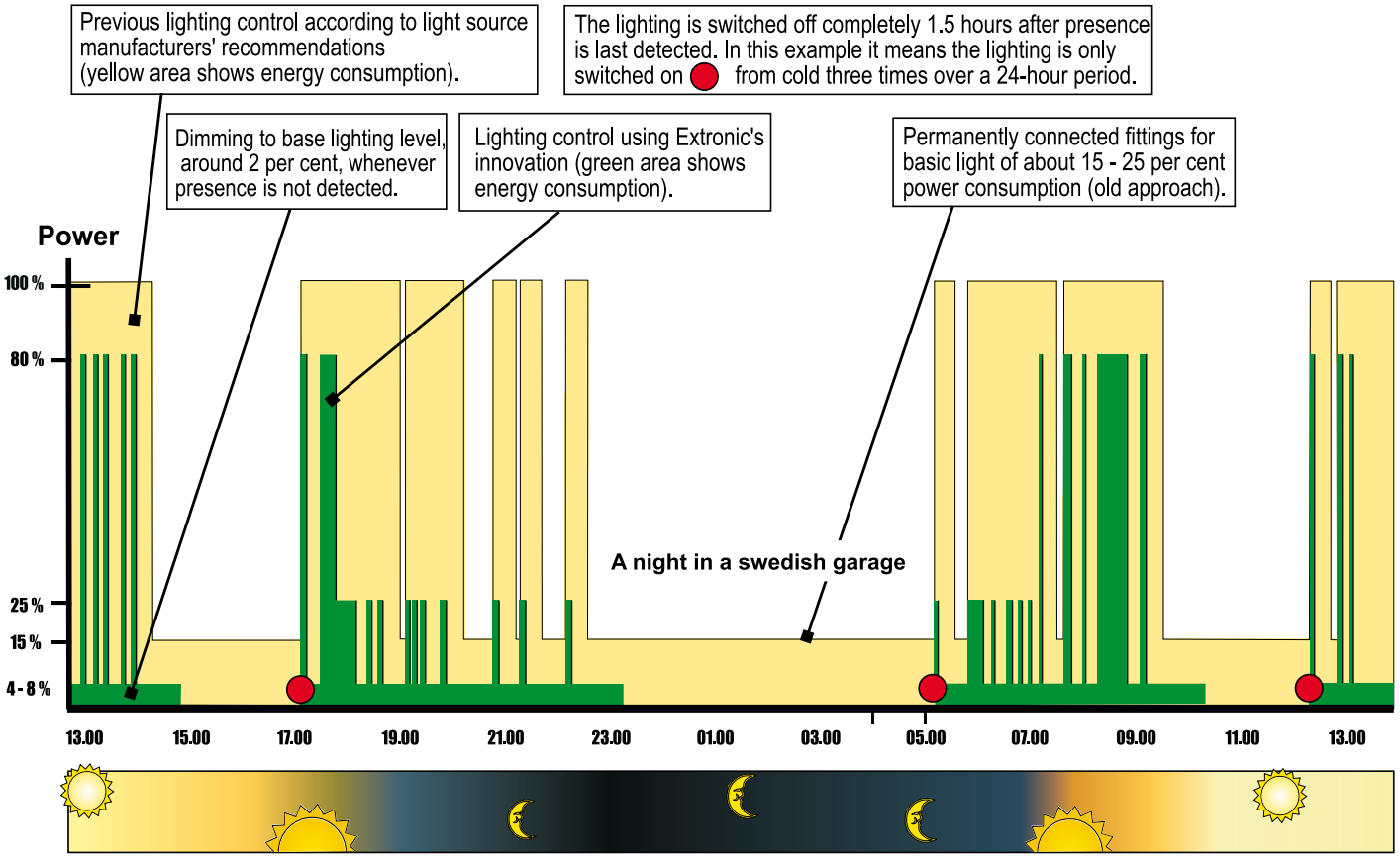
Product	Order no.
Acoustic detector AD-600	13091
Level selector NV-4T	13171
Light sensor	13100
Microphone AD-260U (plastic x 2)	13106
Contactor, three-pole	20480

Alternative components

Microphone AD-260P	13105

The diagram shows the power consumption with lighting control according to the light source manufacturer's recommendations – yellow bars. The green bars show the consumption of an installation that uses the lighting control system described on the previous page: **4. Closed garage with acoustic detector**.

"Dimmable HF ballasts with daylight-dependent "Dynamic lighting control" and four lighting levels."



Special applications

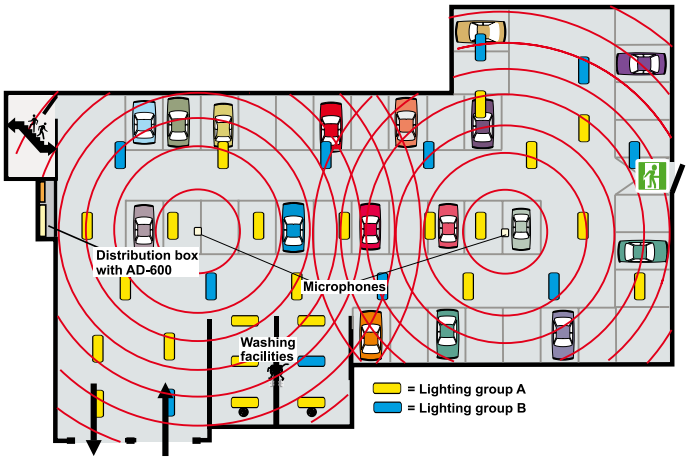
Function mode: TOGGLE (switching, with additional function)
The Toggle function mode is used in areas where the lighting is shared between two lighting groups, A och B. The light fittings should be shared equally between channels A and B.)

This function mode is intended to share the time that light fittings remain lit equally between channels A and B. An equal share of lighting time means uniform wear and hence longer intervals between fluorescent tube replacement. The detector alternately switches off channel A first and channel B first. If only one channel is to be switched on automatically the detector alternates between switching on channel A and switching on channel B.

4. Enclosed garage with acoustic detector

50 Hz light fittings or non-dimmable HF ballasts
(Application example 1B in specification guide at www.extronic.se).

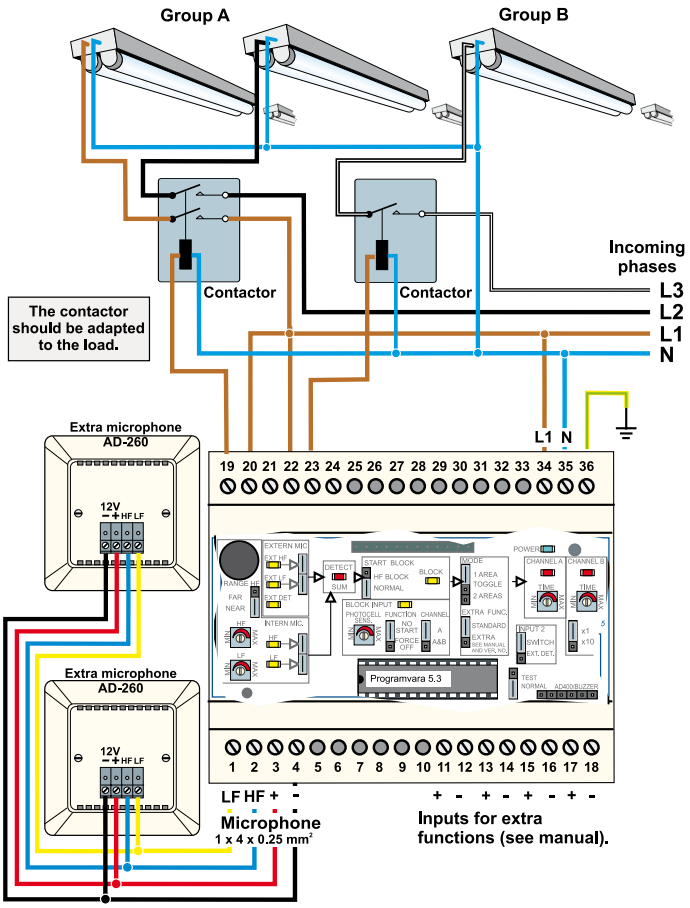
Function mode: TOGGLE
Premises
In a closed single-storey garage, acoustic detection is an unbeatable solution, as it is the only method that permits lights to be switched on before people enter the premises. For open garages, consider using IR detectors.
Light sources
This application shows an example with light fittings that have 50 Hz coil ballasts or non-dimmable HF ballasts. In the case of conventional coil ballasts these should be used with electronic starters (such as AURA Strike) to minimise wear to fluorescent tubes.
Detector placement
This example shows a conventional installation with an acoustic detector. Note the placement of the microphones with up to twice the normal radius between them. The range of the microphones can be up to 20–25 metres depending on acoustic conditions. Ceilings with acoustic panels can reduce the range of the HF signal. The microphones, which are connected in parallel, can be wired using EKKX 1 x 4 x 0.5 mm² cable. See the diagram below.
Control system
The acoustic detector can be regarded as a miniature control unit for presence detection, with the ability to link to other sensors. Additional input signals can be supplied by entrance control systems, magnetic switches and IR detectors to ensure the convenience of the system. The acoustic detector can also supply power for auxiliary IR detectors.
Where a roller shutter door is fitted to a garage, a magnetic switch can be used to ensure that lighting is switched on reliably if the door machinery does not make enough noise itself to turn on the lighting. The choice can be left open until a trial is carried out!



We recommend that the load is divided into two groups of two phases and one phase respectively, controlled by channels A and B of the acoustic detector. When lighting is no longer needed, the first two phases (group A) are switched off, and if presence is not detected within, say, 30 seconds the third phase (group B) is switched off. This means the lighting is switched off in stages, so that if someone is present in the garage when group A is switched off, they just have to make a noise in order for the lighting to be turned on fully again.

The acoustic detector can be programmed so that half the light fittings are switched on and off alternately. This ensures uniform wear and reduces the number of hot starts and the number of times each light fitting is switched on. The need for base lighting is satisfied by separate emergency light fittings.

A garage can be regarded as an area that is heavily trafficked, so the light fittings and control method should be chosen with care. With the right system, detection is generally not a problem, but it is important to consider the best way of controlling the light sources. If you get this wrong it can have unexpected consequences in the form of greatly increased maintenance and wear to light sources and ballasts. On new builds or renovation projects it is very important to study the applications that describe “Dynamic lighting control”!



Components required for this application

Product	Order no.
Acoustic detector AD-600	13091
Microphone AD-260U, x 2.	13106
Contactor, three-pole	20480

Alternative components

Microphone AD-260P	13105

Function mode: TOGGLE EXTRA (switching, with additional function)

This function mode is a variant of Toggle Standard that is specially adapted for **upgrading existing premises with older fluorescent tube light fittings**. Fluorescent light sources wear out quickly if they are switched off and then switched back on again before they have had a chance to cool down. The life of fluorescent tubes is extended considerably if they are allowed to cool down a little before being switched back on.

In TOGGLE EXTRA mode the light fittings are divided into two groups. Both groups are switched on when presence is detected. When presence is no longer detected the first group is switched off after the set time delay (timer A). The second group is switched off after the first group has cooled down for the required time (timer B). The system alternates between switching off group A and group B first

The cool-off time is set with **timer B**.
When the second channel is switched off and it is totally dark, the first channel is assumed to be cool and the second still hot. When the second channel is considered to be “cool” any new presence will switch on both channels.

If someone enters the premises before both channels are “cool”, only the “cool” channel will be switched on. The second channel will remain off until it has cooled down (time set by timer B).
The system can be supplemented with pushbuttons, to allow the lighting groups to be switched on manually even when they are blocked. Pushbutton input 1 can be used to switch both lighting groups on and off manually. Input 2 can only be used to switch both groups on.

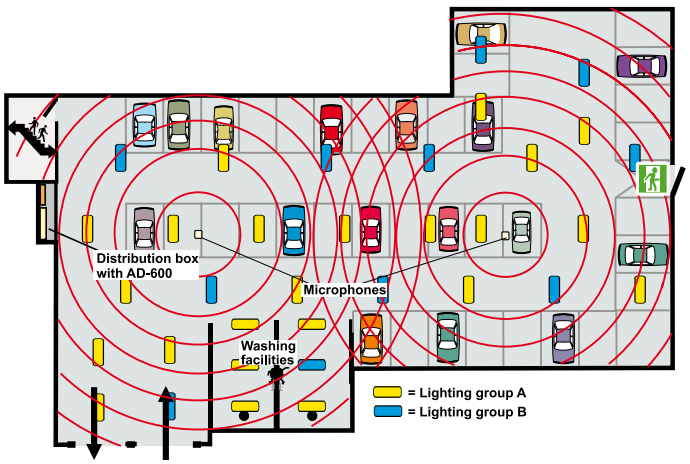
The switch-off delay (the time the lighting remains on after presence is last detected) is set by **timer A**. In function mode it should be remembered when setting this that several presence periods may make up one lighting period.

This means that timer A should be set for a relatively long time.
When this function mode is used the lighting must be configured so that half the light fittings are sufficient to provide adequate lighting.

5. Garage with older fluorescent tubes.

Requirements

In a large workplace parking garage with older fluorescent tubes the lighting has to be switched on and off automatically. In the morning and late afternoon people use the garage for around an hour. In between there are only occasional visits to the garage, but the lighting must still be switched on automatically.



The old light fittings mean that the fluorescent tubes suffer from rapid wear if they are switched on and off without being allowed to cool down after switching off. Switching on fluorescent tubes when they are hot should therefore be avoided.

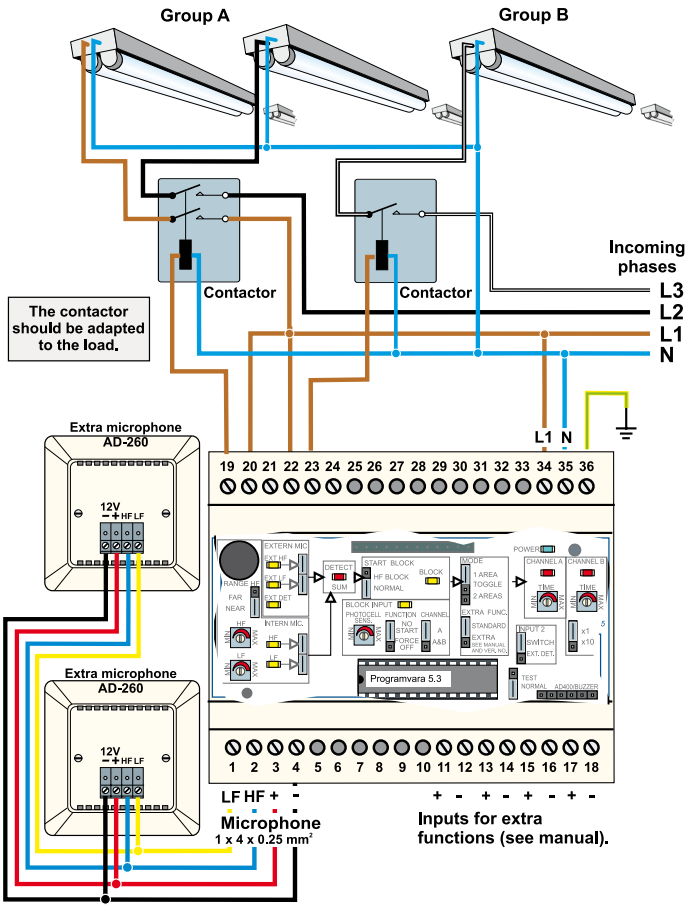
The following example shows how lighting times can be reduced significantly while at the same time extending the life of fluorescent tubes and considerably reducing energy costs.

Solution

The light fittings are divided equally into two groups, A and B. An AD-600, two AD-260 microphones and some pushbuttons are installed. The TOGGLE EXTRA function mode is selected.

The switch-off delay (TA) is set at around 20 minutes using **timer A**. This means that the lighting stays on when the garage is relatively busy in the morning and afternoon.
The cool-off time (TB) is set at around four minutes using **timer B**. This means that the lighting group that is switched off by the detector is not switched on automatically until it has cooled down for four minutes. However the garage is never completely dark when someone is present, since one of the lighting groups is always lit or will be switched on.

The lighting group that is switched off first alternates between group A and group B.



Components required for this application

Product	Order no.
Acoustic detector AD-600	13091
Microphone AD-260U, x 2.	13106
Contactor, three-pole	20480

Alternative components

Microphone AD-260P	13105

Troubleshooting			
Symptom	**Check**	**Cause**	**Action/Remark**
1. Lighting does not come on ⇒ ⇓	**1A.** Is green “POWER” LED lit? **Yes** ⇓ **No** ⇒	**1A1.** Main fuse is blown.	Check the cause of the blown fuse. Replace the glass fuse on the lower board.
		1A2. Power supply not connected.	Connect power supply.
	1B. Are red “CHANNEL A” and “CHANNEL B” LEDs lit? No ⇓ **Yes** ⇒	**1B1.** Output relays faulty	Relays can only handle 5A resistive load. Contactors should always be used.
		1B2. External fault in contactor for example.	Repair or replace faulty components.
	1C. Are the “INTERN MIC” and “EXTERN MIC” jumpers in pla ce? **Yes** ⇓ **No** ⇒	**1C1.** Jumpers may have been swapped. NOTE! AD-600 must not have any jumpers for “INTERN MIC”.	Put jumpers in correct place.
	1D. Are all jumpers (apart from “INTERN MIC” and “EXTERN MIC”) in correct place for application? **Yes** ⇓ **No** ⇒	**1D1.** Detector incorrectly programmed.	If jumpers are not in correct place, operation may be erratic! E.g. if channel B is not used, jumper “x1/x10” must still be in place. Position “x1” or “x10” has no meaning.
	1E. Are any blocking functions active? **No** ⇓ **Yes** ⇒	**1E1.** The blocking functions are activated by the “START BLOCK” jumper or equipment connected to terminals 11–12.	When a signal is detected the relevant yellow LED should light up on AD-500/600 (see photo at top of page 6). If the bypass jumpers are not disconnected the red “DET SUM” LED should light up when presence is detected. If the yellow “BLOCK” LED lights up at the same time as “DET SUM” it means that one of the block functions is active. Find out more about blocking functions on page 9.
	1F. Is an external detector used (e.g. IR detector) to switch off the lighting? **Yes** ⇒	**1F1.** The external detector is connected to terminals 15–16 and the jumper “INPUT 2” is set to “SWITCH”.	The lighting is switched on or off every time the external detector detects presence. Place jumper in “EXT. DET.” position
2. Lighting remains on for too long.	**2A.** Is the switch-off delay set correctly? **Yes** ⇓ **Check** ⇒	**2A1.** Switch-off delay is too long.	A switch-off delay that is too long does not normally affect the total lighting time greatly (see page 7). If necessary adjust the switch-off delay.
		2A2. Switch-off delay is too short.	If the switch-off delay is too short the lighting may be switched off when someone is present. To compensate for this the sensitivity may be turned up, causing the lighting to be lit unnecessarily. Increase the switch-off delay and reduce the sensitivity. See also 2B.
	2B. Is the microphone sensitivity correctly adjusted? **Yes** ⇓ **Check** ⇒	**2B1.** Microphone gain too high (sensitivity set too high). The location of the microphones can affect detection.	Adjust sensitivity, see page 6. Reposition microphones. Check whether LF or HF detection is too sensitive. See page. 6.
	2C. Does the installation have the right capacity? Are the correct number of microphones being used to suit the size and shape of the premises? **Yes** ⇓ **Check** ⇒	**2C1.** If there are too few microphones the sensitivity will have to be set too high	Connect more microphones and turn down the sensitivity.
Troubleshooting chart continues on next page!			

Symptom	Check	Cause	Action/Remark
2.Lighting remains on for too long. (cont.)	**2D.** Is the installation faulty or not suitable for the premises? **Check** ⇒	**2D1.** Access to the premises is through sliding or concertina doors. These do not produce LF sound when they are opened.	Supplement the installation with magnetic switches and/or IR detectors. See pages 3–4.
3. External units do not work.	**3A.** Does the green indicator LED on external AD-260 microphones light up? Is there a 11.5–12.5 V supply on terminal 17–18 in the detector? **Yes** ⇓ **No** ⇒	**3A1.** The 150 mA fuse for the external output has tripped.	Correct the fault. The fuse is reset by disconnecting the supply to the acoustic detector for 10 seconds.
		3A2. Connections are swapped.	Change the connections.
	3B. Are all jumpers (apart from “INTERN MIC” and “EXTERN MIC”) in correct place for application? **Yes** ⇓ **No** ⇒	**3B1.** Detector incorrectly programmed.	If jumpers are not in correct place, operation may be erratic! E.g. if channel B is not used, jumper “x1/x10” must still be in place. Position “x1” or “x10” has no meaning.
	3C. Is the voltage on the microphone/detector inputs correct? **Check** ⇒	**3C1.** Faulty external equipment is connected.	Measure between terminals 1–3, 2–3, 13–14 & 15–16: An inactive input should have a resting voltage of 5–6 V. An active input should have around 0 V. The blocking input, terminals 11–12, should have a resting voltage of 11–12 V when no equipment is connected.
4. Fluorescent tube life is too short.	**4A.** Is the switch-off delay set correctly? **Yes** ⇓ **Check** ⇒	**4A1.** Switch-off delay is too short.	To achieve the maximum energy saving the switch-off delay is set to a short time. There is a risk that this can cause lights to be switched off and on too often. The delay can be increased to reduce this frequency (see page 7 “Time settings”). Ask your fluorescent tube supplier which tubes/light fittings are most suitable.
	4B. Is the microphone sensitivity correctly adjusted? **Yes** ⇓ **Check** ⇒	**4B1.** Microphone gain too high (sensitivity set too high).	High sensitivity gives greater risk of interference, which can even come from neighbouring premises. Reduce the sensitivity and compensate for it by increasing the switch-off delay. Note! Check that lighting is activated correctly.
	4C. Are there sources of external interference? **Check** ⇒	**4C1.** Interfering noise from items such as fans, compressors, lifts, banging doors.	See page 3. Turn down the sensitivity. Reposition the microphones. Use more microphones and turn down the sensitivity.
5. The lighting is switched on and off rapidly at 3–4 second intervals (self oscillation).	**5.** Check if the “FUNCTION” jumper is in the “FORCE OFF” position and if a light sensor is connected. **Check** ⇒	When the lighting is on it activates the light sensor, and in “FORCE OFF” mode the detector is forced to switch off the lights.	A light sensor must NEVER be used in premises when “FUNCTION” is set to “FORCE OFF” mode! Disconnect the light sensor or set the jumper to the “NO START” position
6. The lighting is switched on for a short time (switches off after a couple of seconds) and does not obey the timers.	**6.** Check which position the “TEST - NORMAL” jumper is in. **Check** ⇒	If the jumper is the “TEST” position the delay is only a couple of seconds, regardless of the settings of the “TIME A” and “TIME B” potentiometers.	Move the “TEST - NORMAL” jumper to the “NORMAL” position.

System information

Relevant information about the system should be recorded here and kept close to the system. This facilitates future maintenance, expansion of the system and troubleshooting.

System address: _____

_____

Installation date: _____

Installation company/installer: _____

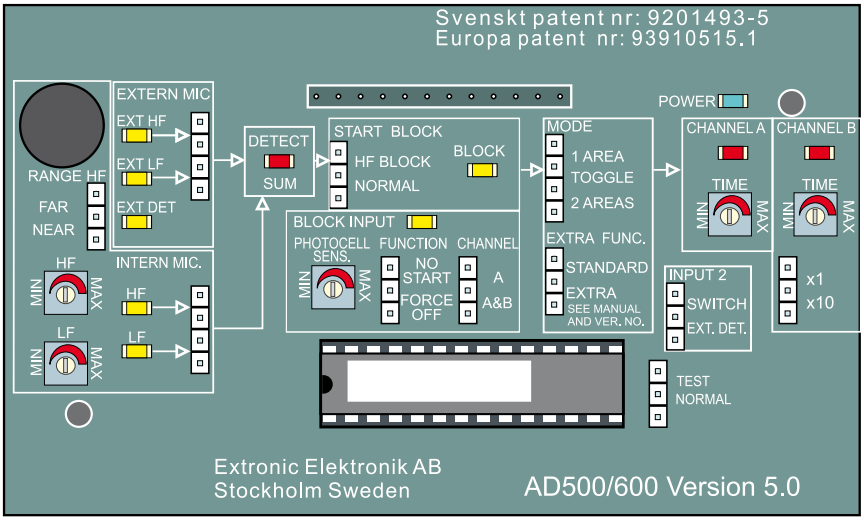
Telephone number: _____

System programming

(Mark positions of jumpers with a marker pen, for example.)

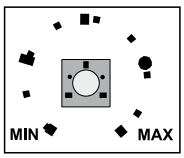
= Programming jumper

Photo shows programming of current system.
(For standard programming, see page 5.)

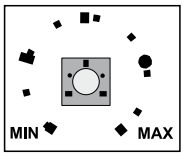


Potentiometer settings:

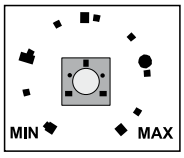
HF setting:



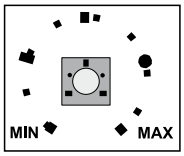
LF setting:



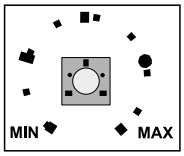
Light sensor:



Timer A (switch-off delay):



Timer B (switch-off delay):

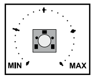


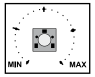
Form for trimming and evaluating presence-controlled lighting using the AD-500 or AD-600.

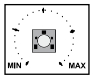
With the aid of this form and a run time meter it is easy to document results of measurements made during installation and adjustment of the AD-500 and AD-600 acoustic detectors.

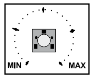
Premises:	Test occasion 1 Date from________Until__________	Test occasion 2 Date from________Until__________	Test occasion3 Date from________Until__________	Test occasion 4 Date from________Until__________
1.	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on
2.	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on
3.	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on	Reading: After Before - A. Run time (hours) B. Number of days: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on	Reading: After Before - A. Run time (hours) B. Number of days:dygn: C. Run time per day (hours): $\frac{A}{B}$ = run time/day D. Number of times switched on: E. Switches/day: $\frac{D}{B}$ = switches/day F. Run time each time switched on: $\frac{A}{D}$ = run time/switched on

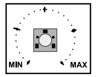
Setting: Mark the settings of the potentiometers as an aid to adjustment.

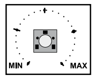
Premises:__________ **LF** 

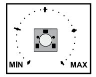
Measurement date: _________ **HF** 

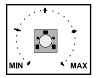
Premises:__________ **LF** 

Measurement date:_________ **HF** 

Premises:__________ **LF** 

Measurement date:_________ **HF** 

Premises:__________ **LF** 

Measurement date:_________ **HF** 

Form for calculating energy savings

Using this form and a run time meter it is easy to document, calculate and show the energy saving that can be or has been made by installing an AD-500/-600 acoustic detector.

Location:	**Installer:**	**Date:**
A. Measurement period: from_____ until _____ =		**A.** _____ days
B. Duration lighting was switched on before installation:		**B.** _____hours
C. Duration lighting was switched on per day before installation: **A/B = _____ hours/day**		**C.** _____ hours/day
D. Duration people were present:		**D.** _____ hours
E. Percentage of time people were present with lighting on = **= D/B x 100 = _____%**		**E.** _____ per cent
F. Fluorescent tube power: No. of fluorescent light fittings _____ x no. of tubes in each fitting _____ x power per tube = **_____W**		
G. Reactor losses: No. of fluorescent light fittings _____ x no. of reactors in each fitting _____ x reactor loss = **_____W**		
H. Total power consumption: (F) _____ + (G) _____ = _____ W = **_____kW** (1000 W = 1 kW)		
I . Energy consumption per year before installation: (H) _____kW x (C)_____ hours (h) x 365 (days per year) = _____kWh/year		
J. Energy consumption per year after installation: (I) _____kWh/year x (D) _____ % = _____ kWh/year		**K. Annual energy saving:** (I) _____kWh - (J) _____kWh = _____kWh
L. Installation costs: Material costs _____ + Labour costs _____= _____		
M. Electricity price: _____ / kWh	**N. Annual saving:** (J) _____/ kWh x (K) _____ kWh = _____/ year	
	O. Payback period: L/N = _____ year	