

# The Autopilot II Quick Setup / Operation

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## GENERAL INFORMATION

### 1. How do they do that?

The Autopilot constructs an invisible three dimensional coordinate system (x, y, and z) in the space below the receivers.

When the Autopilot is running, the coordinates of the beltpack is determined and updated many times per second. The system then calculates the needed pan and tilt data for each spotlight to make it point to the coordinates of the beltpack.

### 2. System Components

See the "AUTOPILOT II SYSTEM FUNCTIONAL BLOCK DIAGRAM".

### 3. APII Terms / Definitions

- a. beltpack transponder element - the transmitting device connected to the beltpack that the system tracks
- b. beltpack height offset - the ability of the system to point a spotlight at the transponder element or directly above or below it
- c. beltpack control channel - the DMX channel which determines whether the spotlight is under light console pan/tilt control or follows a specified beltpack
- d. stage bounds - area inside which the beltpack is followed
- e. zone - an area within the stage bounds inside which the beltpack is followed
- f. coordinate system - a means of specifying the position of an object in 3 dimensional space by specifying the x, y and z coordinates. The "origin" is x=0, y=0 and z=0.
- g. RECEIVER CALIBRATION procedure - procedure to construct the invisible 3 dimensional coordinate system and allow the system to determine the x, y and z coordinates of each receiver. It consists of placing the beltpack on 4 points on the stage and allowing the system to take data from each point.
- h. SPOTLIGHT CALIBRATION procedure - procedure allowing the system to determine the x, y, and z coordinates and orientation of each spotlight. It consists of moving the light beam to 4 points on the stage.

### 4. DMX-512 Channel Assignments

- a. Each spotlight will have the following DMX channels assigned:
  1. start address - the DMX starting address of each spotlight
  2. you will assign to each light an APII beltpack control channel - see definitions

DMX level control is:

- |        |  |
|--------|--|
| 0-19%  | pan and tilt is manually controlled by light console |
| 20-39% | follow beltpack #1                                   |
| 40-59% | follow beltpack #2                                   |
| 60-78% | follow beltpack #3                                   |

79-98% follow beltpack #4

- b. Unless you choose the height offsets to be controlled by the PC, you will assign for each beltpack a "height offset" DMX channel which will cause the spotlight to point to the beltpack element or to a point directly above or directly below it.

| height offset<br>DMX level | spotlight<br>focus          |
|----------------------------|-----------------------------|
| -----                      | -----                       |
| 100%                       | 6 ft above beltpack element |
| 50%                        | at beltpack element         |
| 0%                         | 6 ft below beltpack element |

## **HARDWARE INSTALLATION -- SUMMARIZED**

### **1. APII Receiver Installation**

- a. recommended height is 20-30 ft. above the stage
- b. generally, place them around the perimeter of the coverage area with a few overhead
- b. at least 3 receivers need an unobstructed view of the beltpack transponder element at all times (very important)
- d. aim each receiver so the front of it approximately faces the opposite boundary on the floor.
- e. beltpack to receiver distance limit is 65 ft.

### **2. Spotlight Installation**

- a. install the spotlights so they can focus within the coverage area
- b. yolk lights must be hung at the edge of the coverage area (or over it angled at 45 deg) with the LED panel away from the coverage area

### **3. APII Controller Installation**

- a. hang the temperature sensor about 10 ft. above the stage floor
- b. connect the controller between the DMX source and the lights to be controlled
- c. you will want to see the stage floor from the PC/laptop computer for system calibration – so extend the APII controller-to-PC cable using a 5 pin DMX cable

### **4. Beltpack and Transponder Element**

- a. attach the transponder element somewhere high and with an unobstructed view upward (e.g. on the top of the head or shoulder)
- b. the transponder element MUST be pointed mostly upward
- c. the beltpack LED indicates both POWER ON and a good battery
- d. the switch in the battery compartment sets the beltpack "channel" - #1, #2, #3 or #4
- e. be SURE there is only ONE beltpack #1 (or #2, etc) on the stage at one time

## **SYSTEM SETUP / CALIBRATION / OPERATION -- SUMMARIZED**

1. **Save / retrieve setups**
  - a. use SYSTEM SETUP > FILES to save or retrieve setups (light info, rcvr and light calibration data, etc) to/from PC disk. This is helpful in permanent installations.
2. **Input basic system parameters**
  - a. be sure "Serial link active" indicator is green (otherwise nothing will work)
  - b. at SYSTEM SETUP > BASIC SETUP
  - c. select the PC COM port, override the temp sensor if you forgot to pack it
3. **Input spotlight information**
  - a. at SYSTEM SETUP > CONFIGURE LIGHTS
  - b. specify light models used, the starting DMX address, the beltack control channel for each light
  - c. "advanced" light parameters are: light zone assignments, dead zone diameter
4. **Perform the "Receiver Calibration" procedure**
  - a. First, open the "Received Signal Quality" screen to confirm the rcvrs are getting good signals at SYSTEM SETUP > CALIBRATE RECEIVERS. Select, mark and measure the positions on the floor - point 1, 2, 3, 4 (space them generously around the coverage area - 1/3 to 1/2 of the way across the rcvr footprint)
  - d. make the line between points 1 and 2 parallel to the front of the stage
  - e. choose these points so all 8 receivers can receive the signal from all beltacks at these points
  - f. place beltack on these 4 points and follow screen instructions
  - g. use a fresh battery in the beltack
5. **Perform the "Spotlight Calibration" procedure**
  - a. at SYSTEM SETUP > CALIBRATE LIGHTS
  - b. use the 4 beltack "spike" points or place the 4 beltacks on the stage (spacing them generously - space them 1/4 to 1/2 of the rcvr footprint distances)
  - c. move the light beam to be centered on the 4 points using the PC arrow keys (this is where you need to see the stage floor)
  - d. most folks use MANUAL CAL
  - e. the beltack transponder elements need not be on the floor for this – but, put the element's shadow in the center of the light beam
6. **Input zones and boundaries information**
  - a. at SYSTEM SETUP > SETUP ZONES/BOUNDARIES
  - b. input the stage bounds and zones as desired
  - c. input the light's fade distance for the edges of the stage bounds and zones
  - d. be sure to click on the red box "APII box update" for this info to be saved - the update can take up to 60 seconds - you must allow this to be completed
7. **Testing the System Setup and Calibration**
  - a. NO DMX512 signal is needed for these tests
  - b. use TEST > TEST RECEIVERS to open the "Received Signal Quality" - very helpful! You can also use this to view a 2D, plan view of the receivers and beltacks

- c. use TEST > TEST LIGHTS to follow a specified beltpack and also to point a light to spike #1 (this ignores zones)
- d. use TEST > TEST ZONES as above but with zones in effect and also to use a light to trace the outline of the stage bounds or a zone
- e. use TEST > TEST RUN to follow a specified beltpack but with zones active (you cannot trace a zone boundary with a light - it's a simplified screen)
- f. use TEST > WYBER DIAGNOSTICS to get advanced details to troubleshoot problems - such as Rcvr and beltpack position data (xyz coordinates)

## 8. View or Input more information

- a. use RUN > BELTPACK HEIGHT OFFSET to select the height offset control (and the actual height offset) at the PC or from a DMX channel/value from the light console

## 9. Running the System

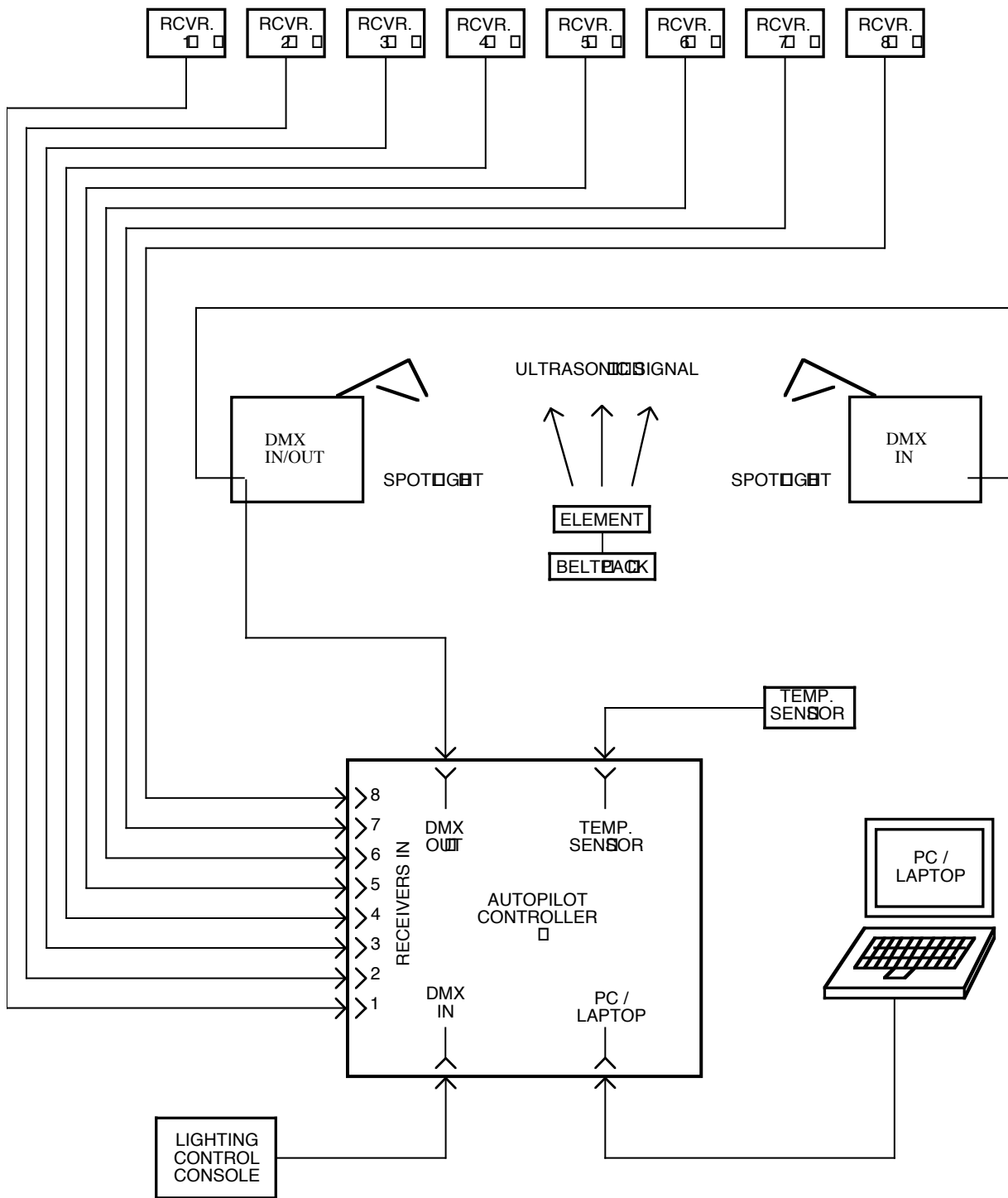
- a. use RUN > START / STOP to start or stop the system
- b. a DMX512 signal source IS needed to RUN the system from this menu
- c. leave the "Received Signal Quality" screen displayed so you can monitor the system

## 10. Checking system performance in the RUN mode

- a. use RUN > START / STOP to start the system
- b. hold a transponder element pointed up and walk on stage to be sure the desired lights follow you
- c. walk around with the transponder element located as the performer will wear it to be sure the lights follow properly
- d. go to the "stage boundaries" (and zones, if any) that you have set and see that the lights "fade" as desired as you cross the boundary.
- e. use a DEAD ZONE of 1-2 ft (dead zone is a radius, not a diameter)

## 11. In Case of Trouble

- a. use the extensive (click on HELP) help system for setup and troubleshooting assistance
- b. look at the "Rcvr Signal View" screen to see that the desired beltpack is "on" and most receivers are getting a good beltpack signal
- c. check the beltpack is set to the desired beltpack number and it's LED is ON - also, the beltpack element is pointing upward and has a clear path to the receivers
- d. the spotlights are the correct DMX address, personality, mode type, etc
- e. check that you have lighting console (manual) control of the spotlights
- f. the stage boundaries are reasonable
- g. your DMX source is outputting DMX levels as desired
- h. if a light tracks but points at your feet, the "beltpack height offset" needs to be corrected.



AUTOPILOT II SYSTEM  
FUNCTIONAL BLOCK DIAGRAM

**ADDITIONAL INFORMATION YOU MIGHT FIND USEFUL .....**

## 1. System Setup / Installation

- a. the 3 most important issues with APII installation are:
  1. pick a good pattern of receivers
    - surround the coverage area with 2 overhead
  2. perform a good RCVR CAL
  3. good beltack element placement on the performer
    - top of head / shoulder
    - block it as little as possible
    - back of collar is bad cuz the signal is easily blocked
- b. put rcvrs on drop arms to get them below the truss clutter - the beltack needs to "see" 'em
- c. if you forget what step to do next setting up the system, just follow the sequence of the menu tabs
- d. if you power up the controller with no PC connected, it will fall into the RUN mode after about 70 seconds (you need external DMX signal for the RUN mode).
- e. the LEDs on the rcvrs and on the controller indicates a rcvd signal but not necessarily one usable for distance measuring - minimal processing has been done on the signal for these LEDs. They are, however, good as "rough" rcvd signal indicators showing that there is no signal blockage, the beltack and rcvrs are working, etc.
- f. current system software (as of 1 Nov, 2006)
  1. controller ap2v12.apc
  2. PC GUI v2.3a

## 2. System Operation

- a. signal reflections - the ultrasonic signal is easily reflected by walls, etc – this can cause false beltack locations during "receiver calibration"
- b. iris auto-size - when auto-size is ON, the APII system will keep the light beam diameter as set by the light console (to within the size limits of the light fixture)

## 3. Receiver Calibration

- a. reasons why RECEIVER CALIBRATION can fail and what to do about it
  1. some rcvrs do not receive the beltack signals - before doing the RCVR CAL procedure, open the RECEIVER SIGNAL VIEW screen (at TEST > TEST RCVRs) to see that the rcvrs are getting good beltack signals
  2. you entered the "distance 1", etc distances incorrectly
  3. the spacing of the 4 points is too small - move the 4 points further apart (a distance of 1/3 to 1/2 of the foot print of the rcvrs)
  4. a marginal beltack battery can cause problems - use a fresh battery
- b. If you are doing RECEIVER CALIBRATION with one beltack, open the "View collected data" screen so you know that, in each beltack position, the data is good.
- c. If you need to do RECEIVER CALIBRATION with the beltacks above the floor due to set pieces being in the way, enter the height of the beltack elements (Height of BPs) above the floor at the same screen where you enter the distances between points 1-4.
- d. all 4 RECEIVER CALIBRATION points must be on the same plane (the same height).

- e. the system will not track below the "floor" (z=0) - you set the "floor" level when you enter the "Height of BPs" when setting up RECEIVER CALIBRATION
- f. if the receivers are low (<15 ft), you may get interfering floor reflections resulting in poor received signals – if so, place thick cloth (and > 6"x6" sq.) underneath the backpack element

### 3. **Spotlight Calibration**

- a. for SPOTLIGHT CALIBRATION, the backpack element does not need to be on the floor - they can be almost anywhere. Space them generously around the stage. If you raise the element above the floor, adj the light beam so the shadow of the element is in the center of the light beam.
- b. you can do SPOTLIGHT CALIBRATION using the spike points 1-4 if you wish.
- c. If you are calibrating a yolk light, the system will start it with a 10 deg tilt - be sure that tilt is in the direction of the coverage area. If it is not, turn the light around or reverse pan and tilt. Then, when moving it, change tilt first and only then change its pan - this assures that it is not spun 360 deg from where you think it is. Also, it should be placed at the perimeter of the stage bounds so it does not flip 360 deg as the performer moves around the stage.

### 4. **Stage Bounds / Zones**

- a. if you change the stage bounds or zones, don't forget to click on the red "APII box update" and the update process can take up to 60 sec
- b. the light will track you - but with the light shuttered off - outside the stage bounds
- c. the stage bounds are limited to 2400 square feet - but, you can override this by erasing all stage bounds and zones. Doing this, you lose functions that stage bounds and zones give you.

### 5. **Misc**

- a. PC requirements (Mac's are not compatible)
  - op sys - WIN 95, 98, NT, 2000, XP
  - Proc 300MHz +
  - DB9 serial COM port
  - RAM - 32meg +
  - a laptop with a USB serial COM port has been used but the serial communication has occasionally been erratic
- b. if you cannot get the serial link active
  - cycle power on the APII controller - leave it unpowered for 5 seconds
  - or, power up the controller then open the APII app on the PC

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