



Advancing The Art Of Lighting

Autopilot II

Quick Setup

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Background

How Autopilot Works

Autopilot constructs an invisible three-dimensional coordinate system (x, y, and z axes) in the space below the Autopilot receivers. In this space, the performers wear backpacks that send signals to the receivers, updating the performers' locations multiple times per second. The system then calculates how the light fixtures must pan and tilt so the light shines on the performers.

Autopilot Terms and Definitions

Beltpack control channel: The DMX channel that determines whether the spotlight is controlled by a light console or follows a specific beltpack.

Beltpack height offset: The ability of the system to point a spotlight at the transponder element or directly above it.

Beltpack transponder element: The transmitting device (connected to the beltpack) that the system tracks.

Coordinate system: A means of specifying the position of an object in three-dimensional space by specifying its x, y, and z coordinates, where the origin is $x=0$, $y=0$, and $z=0$.

Receiver Calibration procedure: The procedure to construct the invisible three-dimensional coordinate system and allow the system to determine the x, y, and z coordinates of each receiver. The procedure consists of placing the beltpack at four different points on the stage and allowing the system to collect data from each point.

Spotlight Calibration procedure: The procedure allowing the system to determine the x, y, and z coordinates and orientation of each light. The procedure consists of moving the light beam to four different points on the stage.

Stage boundaries: Area where the beltpack is tracked.

DMX512 Channel Assignments

Each light will have the following DMX channels assigned:

1. Start address: The DMX starting address of each light.
2. Control channel: The address that controls the light.

DMX Level Control

Percentage	Control
0-19 percent	Pan and tilt manually controlled by beltpack
20-39 percent	Follow beltpack 1
40-59 percent	Follow beltpack 2
60-78 percent	Follow beltpack 3
79-98 percent	Follow beltpack 4

Unless you decided to let the height offsets be controlled by the computer, you will assign a height offset DMX channel to each beltpack. This will cause the light to point either to the beltpack itself or to a point directly above or below it.

Height offset DMX level	Spotlight focus
100 percent	6 feet above beltpack element
50 percent	Directly at beltpack element
0 percent	6 feet below beltpack element

Hardware Installation

Receiver Installation

- Place the receivers around the perimeter of the coverage area with a few overhead. The recommended height is 20 to 30 feet above the stage.
- **IMPORTANT:** At least three receivers need an unobstructed view of the beltpack transponder element at all times.
- Aim each receiver so the front faces the opposite boundary on the floor.
- The distance between the receiver and each beltpack cannot exceed 65 feet.

Spotlight Installation

- Install the spotlights so they can focus within the coverage area.
- Yoke lights must be hung at the edge of the coverage area (or over it, angled at 45 degrees) with the LED panel away from the coverage area.

Autopilot Controller Installation

- Hang the temperature sensor about 10 feet above the stage floor.
- Connect the controller from the DMX source to the lights that will be controlled. Extend the Autopilot-to-computer cable using a 5-pin DMX cable. You'll need to see the stage floor from your computer when you calibrate the system.

Beltpack and Transponder Element Installation

- Attach the transponder element somewhere high on the performer's body, somewhere with an unobstructed view (such as the top of the head or the shoulder).
- The transponder element **MUST** be pointed mostly upward.
- The beltpack LED indicates both POWER ON and a good battery.
- The switch in the battery compartment sets the beltpack channel to 1, 2, 3, or 4.
- Be sure that no performers on stage have their beltpacks set to the same channel (i.e., two performers with both beltpacks set to channel 2).

System Calibration/Operation

1. Save / Retrieve Setups

- Use SYSTEM SETUP > FILES to save or retrieve setups to and from the computer. This is helpful for permanent installations.

2. Input Basic System Parameters

- Make sure the iSerial Link Active indicator is green, otherwise nothing will work.
- At SYSTEM SETUP > BASIC SETUP, select the PC Com port (and override the temp sensor if you forgot to pack it).

3. Input Spotlight Information

- At SYSTEM SETUP > CONFIGURE LIGHTS, specify the light models used, the starting DMX address, and the beltpack control channel for each light.
- The "advanced" light parameters are "light zone assignments" and "dead zone diameter."

4. Perform Receiver Calibration Procedure

- Open the "Received Signal Quality" screen to confirm that the receivers are getting good signals at SYSTEM SETUP > CALIBRATE RECEIVERS.
- Select, mark, and measure the positions on the floor (points 1, 2, 3, and 4). Space them generously around the coverage area – one-third to one-half of the way across the receiver footprint.
- Make sure these points are arranged so that all eight receivers can receive signal from all the beltpacks. Also make sure that the invisible line between points 1 and 2 is parallel to the front of the stage.
- Place one beltpack at each of the four points and follow the on-screen instructions. Use a fresh battery in each beltpack.

5. Perform Spotlight Calibration Procedure

- At SYSTEM SETUP > CALIBRATE LIGHTS, use the four beltpack "spike" points, or place the four beltpacks on the stage, spacing them out generously, one-fourth to one-half of the receiver footprint distance.
- Using the computer's arrow keys, center the light beam in the middle of the beltpacks. (You must be able to see the stage from your computer.)
- Most people use MANUAL CAL.
- The beltpack's transponder elements don't need to be on stage for this, but keep the elements' shadow in the center of the light beam.

6. Input Zones and Boundaries Information

- At SYSTEM SETUP > SETUP ZONES/BOUNDARIES, input the stage boundaries and zones as desired.
- Input the light's fade distances for the edge of the stage boundaries and zones.
- Be sure to click on the red box "APII Box Update" to save this information. The update can take up to 60 seconds.

7. Testing the System Setup and Calibration

- Use TEST > TEST RECEIVERS to open "Received Signal Quality." You can also use this to access a two-dimensional plan view of the receivers and beltacks.
- Use TEST > TEST LIGHTS to follow a specified beltack and to point a light to spike 1 (this ignores zones).
- Use TEST > TEST ZONES as above, but with zones in effect. Also use this to trace the outline of the zone or stage boundaries.
- Use TEST > WYBER DIAGNOSTICS to get advanced details (such as receiver and beltack position data) for help with troubleshooting.
- These tests DO NOT require DMX signal.

8. View or Input More Information

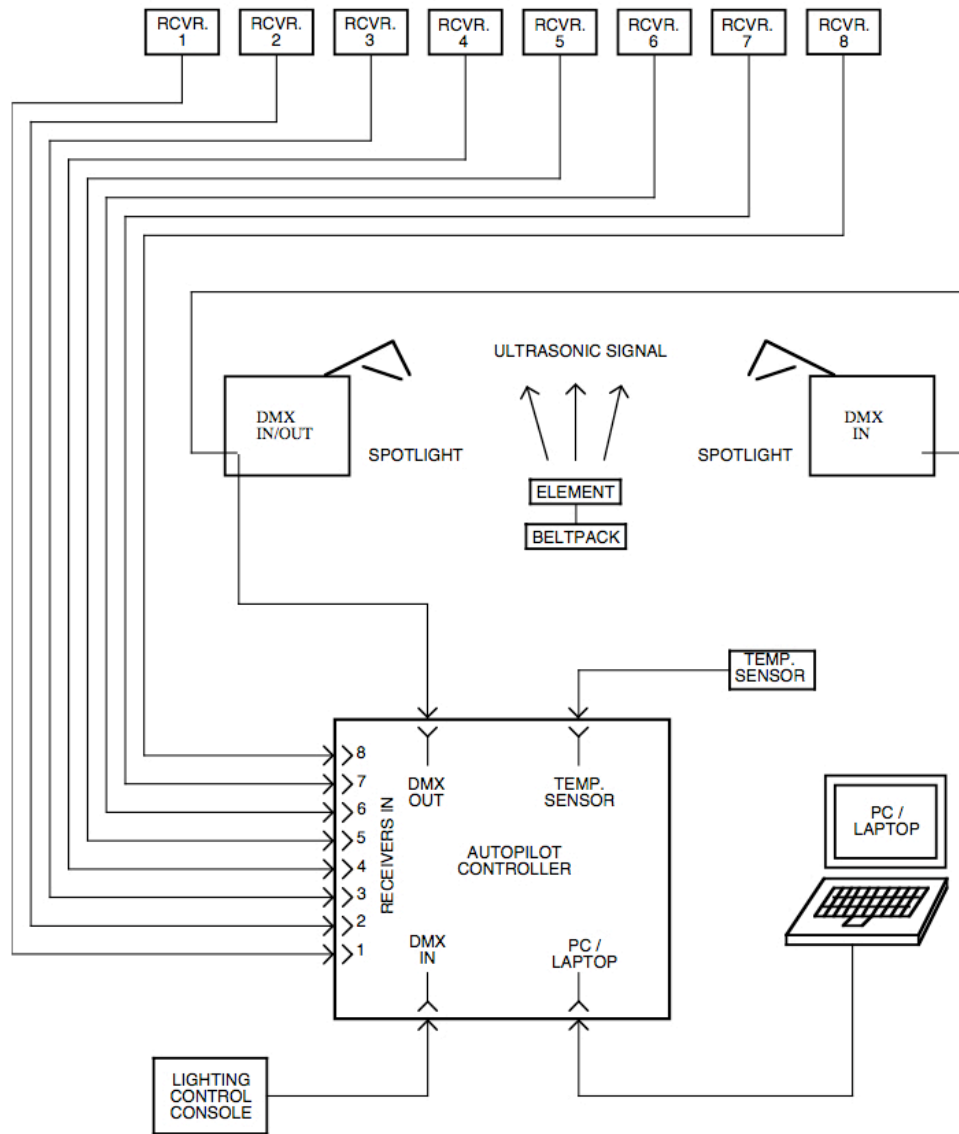
- Use RUN > BELTPACK HEIGHT OFFSET to select the height offset control (and the actual height offset) at the computer from a DMX channel at the console.

9. Running the System

- Use RUN > START/STOP to start or stop the system. This requires a DMX signal.
- While the system runs, leave the "Received Signal Quality" screen displayed so you can monitor its operation.

10. Checking system performance in the RUN mode

- Use RUN > START/STOP to start the system.
- Hold up a transponder element and walk on stage to make sure the desired light (or lights) follows you.
- Walk around the stage holding the transponder element near the same place the performer will wear it, making sure the lights follow properly.
- Go to the stage boundaries (and the edge of any zones) to make sure the lights fade.
- Use a dead zone with a radius of one to two feet.



AUTOPILOT II SYSTEM
FUNCTIONAL BLOCK DIAGRAM

In Case of Problems

- Use the extensive help system for setup and troubleshooting assistance.
- Inspect the "Receiver Signal View" screen to make sure the desired beltpack is on and the receivers are getting a good signal from the beltpack.
- Check that the beltpack is set to the desired beltpack channel number and its LED is on. Make sure the beltpack element is pointing up with a clear "path" to the receivers.
- Check that the lights are the correct DMX address, personality, mode type, etc.
- Check that you have console (manual) control of the lights.
- Make sure the stage boundaries are reasonable.
- Make sure your DMX source is outputting the desired DMX levels.
- Check the beltpack's height offset.

Miscellaneous Tips

- **The three most important parts of Autopilot II installation:**

1. Arrange a good pattern of receivers. Surround the coverage area and place two overhead.
2. Perform a good Receiver Calibration.
3. Place the beltack at a good spot on the performer. The beltack should be blocked as LITTLE AS POSSIBLE to allow a clear signal. The top of the head and shoulder are good locations.

- To keep the receivers clear of truss clutter, put them on drop arms. The beltacks must "see them."
- If you forget the next step when setting up the system, just follow the order of the menu tabs.
- If you power up the controller with no computer connected, it will fall into the RUN mode after about 70 seconds. (You need external DMX signal for the RUN mode.)
- The LEDs on the receivers and the controller indicate a received signal -- but not necessarily signal usable for distance measuring. They're good as a rough guide showing that there's no signal blockage, the beltacks and receivers are working, etc.

Reasons why Receiver Calibration can fail (and what to do about it)

- Some receivers don't receive the beltack signals. Before performing the Receiver Calibration procedure, open the RECEIVER SIGNAL VIEW screen (at TEST > TEST RECEIVERS) to make sure the receivers are getting good beltack signals.
- You may have entered the distances incorrectly.
- The spacing between the four points may be too small. Move the four points further apart (a distance of one-third to one-half of the footprint of the receivers).
- A dying battery in the beltack can cause problems Try a fresh battery.

Misc. Receiver Calibration advice

- Be aware that Autopilot's ultrasonic signal is easily reflected by walls and other smooth surfaces. This can result in false beltack locations during Receiver Calibration.
- When performing Receiver Calibration with one beltack, open the "View Collected Data" screen so you know that the data is good.

- If you need to perform Receiver Calibration with the beltacks above the floor (due to set arrangement), enter the height of the beltacks at the same screen where you enter the distances between points 1 and 4. All four points MUST be at the same height.
- The system will not track below the floor ($z=0$). You set the floor level when you enter the height of the beltacks while performing Receiver Calibration.
- If the receivers hang low (under 15 feet), reflections from the floor may interfere with the signal. If so, place a thick cloth (at least six feet by six feet square) underneath the beltack element.

Misc. Spotlight Calibration Advice

- During Spotlight Calibration, the beltacks don't need to be on the floor; they can be almost anywhere, so space them generously around the stage.
- If you raise the element above the floor, adjust the light beam so the shadow of the element is in the center of the beam.
- You can also perform Spotlight Calibration using just the spike points if you wish.
- When you calibrate a yoke light, the system will begin with a 10 degree tilt. Be sure the tilt is in the direction of the coverage area. If it isn't, turn the light around or reverse pan and tilt. Then, when moving the light change tilt first, then change its pan (after stopping the tilt). This assures that it's not spun 360 degrees from where you think it is. Additionally, the light should be placed at the perimeter of the stage boundary so it doesn't flip 360 degrees as the performer moves around the stage.

Stage boundaries/zones

- If you change the stage boundaries or zones, don't forget to click on the red APII Box Update. The update process can take up to 60 seconds.
- The light fixture will track you, but with the light shuttered off, outside the stage boundaries.
- The stage boundaries are limited to 2,400 feet, but you can override this by erasing all boundaries and zones. Keep in mind that you'll lose the functions that boundaries and zones provide.