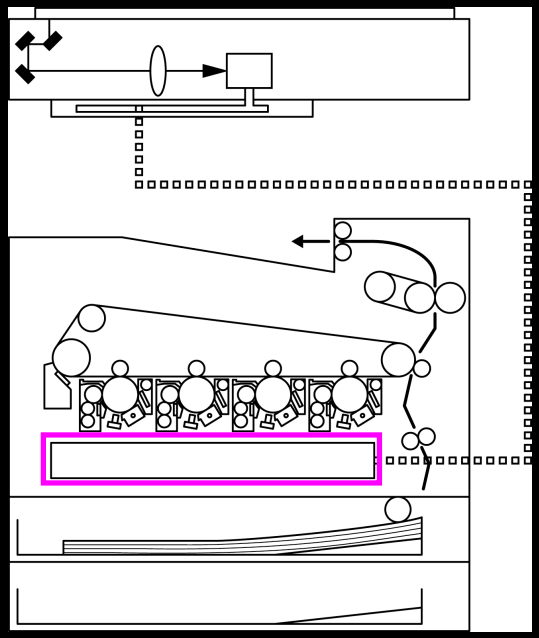
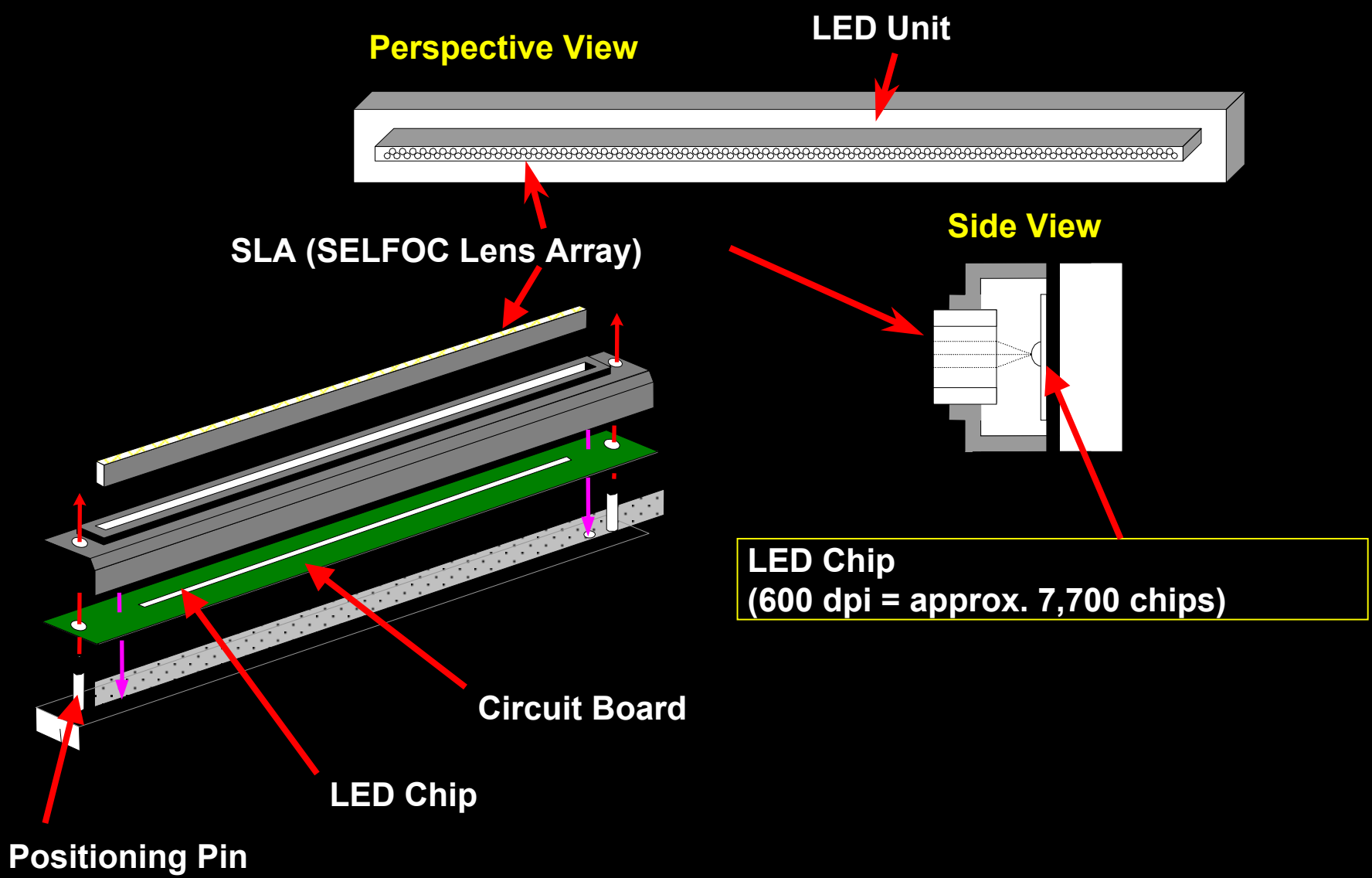
4. PIC Section

PIC: Print Image Control



1. LED Print Head (LPH)
2. LED Gradation Reproduction System
3. Outline of the PIC Section
4. PIC Image Processing Flow
5. Color Shift Correction System

4.1 LED Print Head (LPH)



4.1.1 Features of LED Print Head

(Similar to 7920)

Advantages

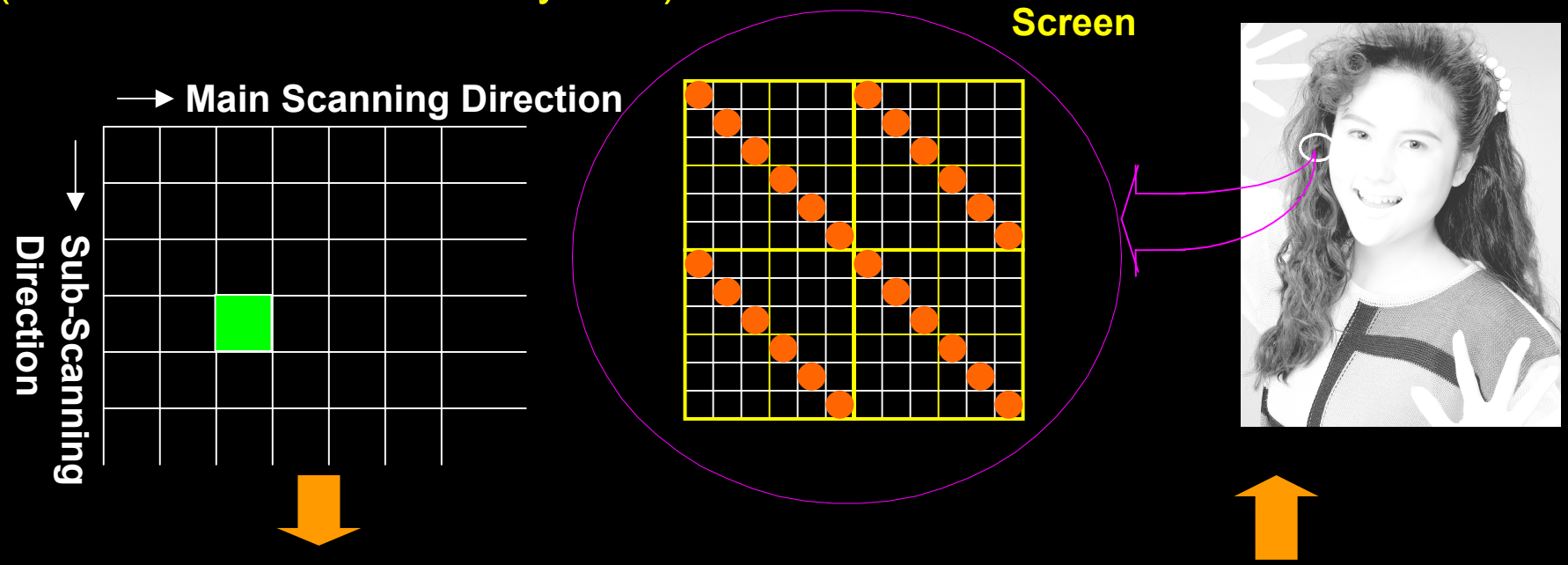
- **The Optical System is designed compact.**
- **It is easier to achieve the goal of high-speed printing.**
- **The body is more resistant to deformation under changing environmental conditions.**
- **It is easier to make optical adjustments (optical path, optical axis, etc.).**

Required New Technology (To increase LPH Efficiency)

- **Intensity correction technology that makes the intensity of all light emitting bodies uniform.**
- **Gradation reproduction technology that produces no uneven intensities on the image.**
- **Registration and Skew Correction technology that corrects any distortion in the LED itself.**

4.2 LED Gradation Reproduction System

(Common with the 7920 System)

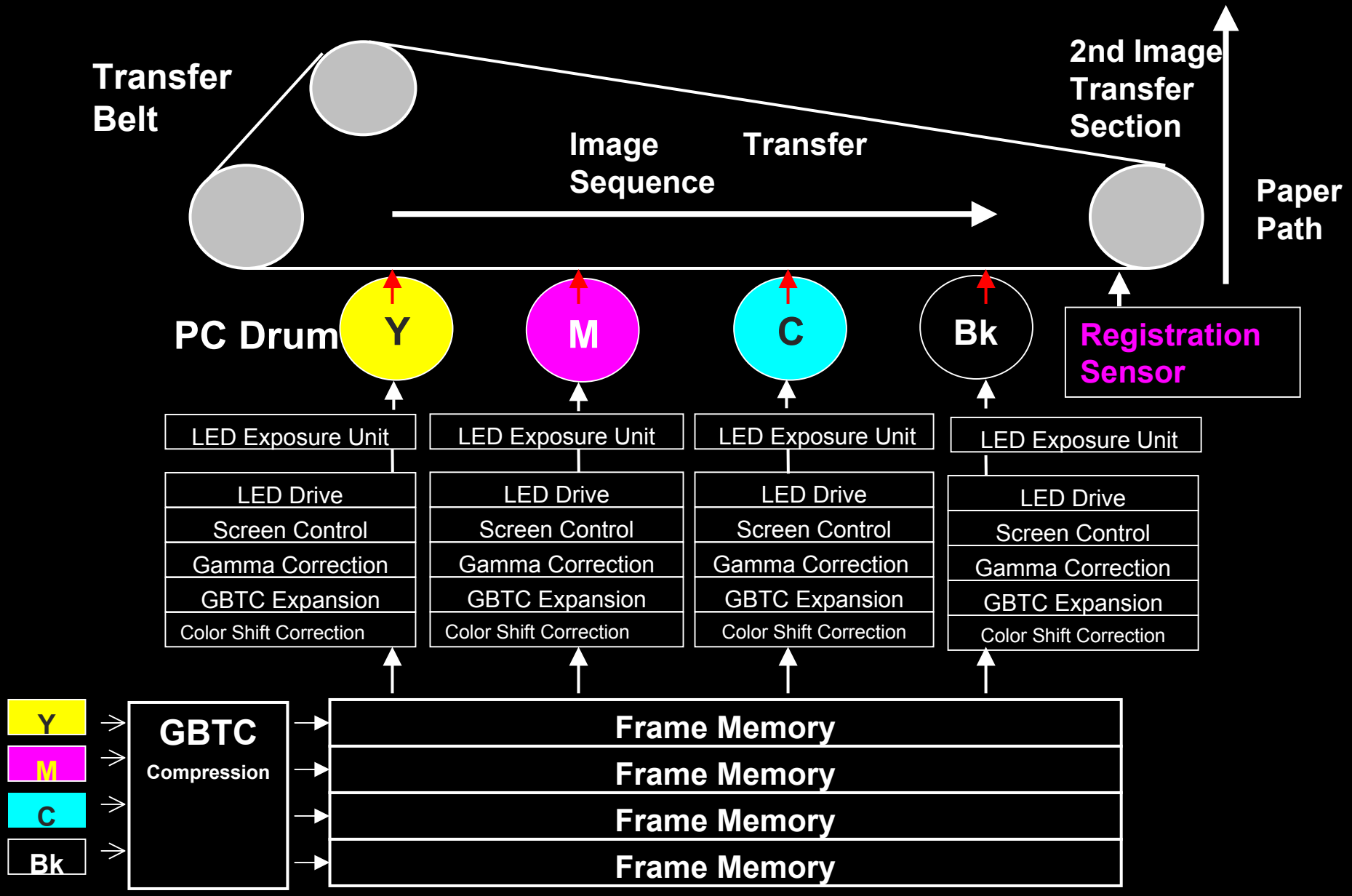


48 gradation levels per 1 pixel (4bit X 3) < 256 gradation levels

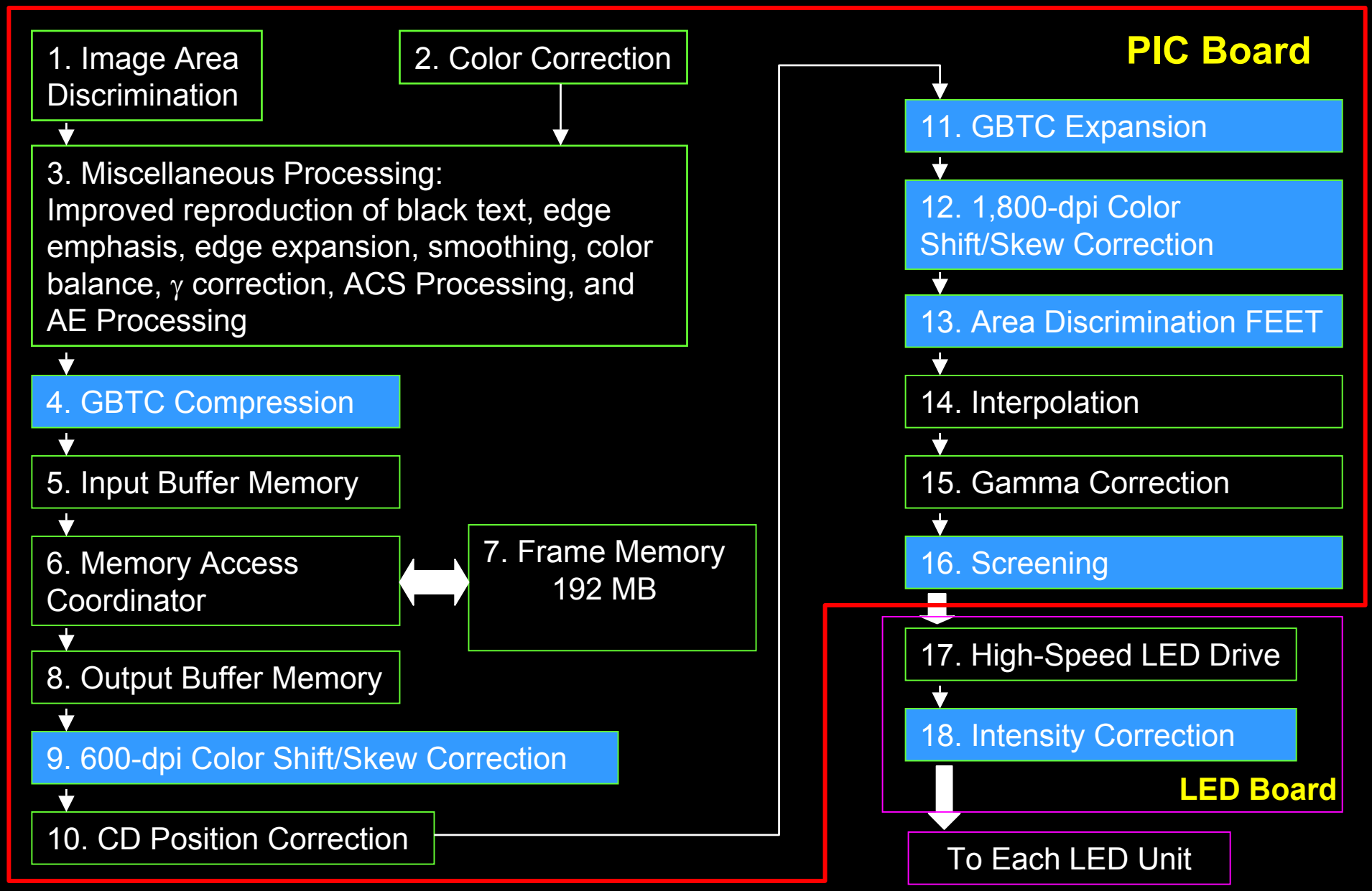
4.2.1 Screen Patterns

Original Mode	Section	Specific Processing Performed & Screen Pattern
Text & Photo	Reading	Black text discrimination + Dot discrimination
	Writing	FEET + Screen optimized for resolution or Screen optimized for gradation
Photo Image	Reading	Black text discrimination + Dot discrimination
	Writing	Screen optimized for gradation or Screen optimized for resolution
Printed Image	Reading	Smoothing
	Writing	Screen optimized for gradation or Screen optimized for resolution
Text	Reading	Black text discrimination + Dot discrimination
	Writing	FEET + Screen optimized for resolution
Map	Reading	Black text discrimination + Dot discrimination
	Writing	FEET + Screen for Map mode
Copied Image	Reading	Black text discrimination + Dot discrimination
	Writing	FEET + Screen optimized for resolution or Screen optimized for gradation

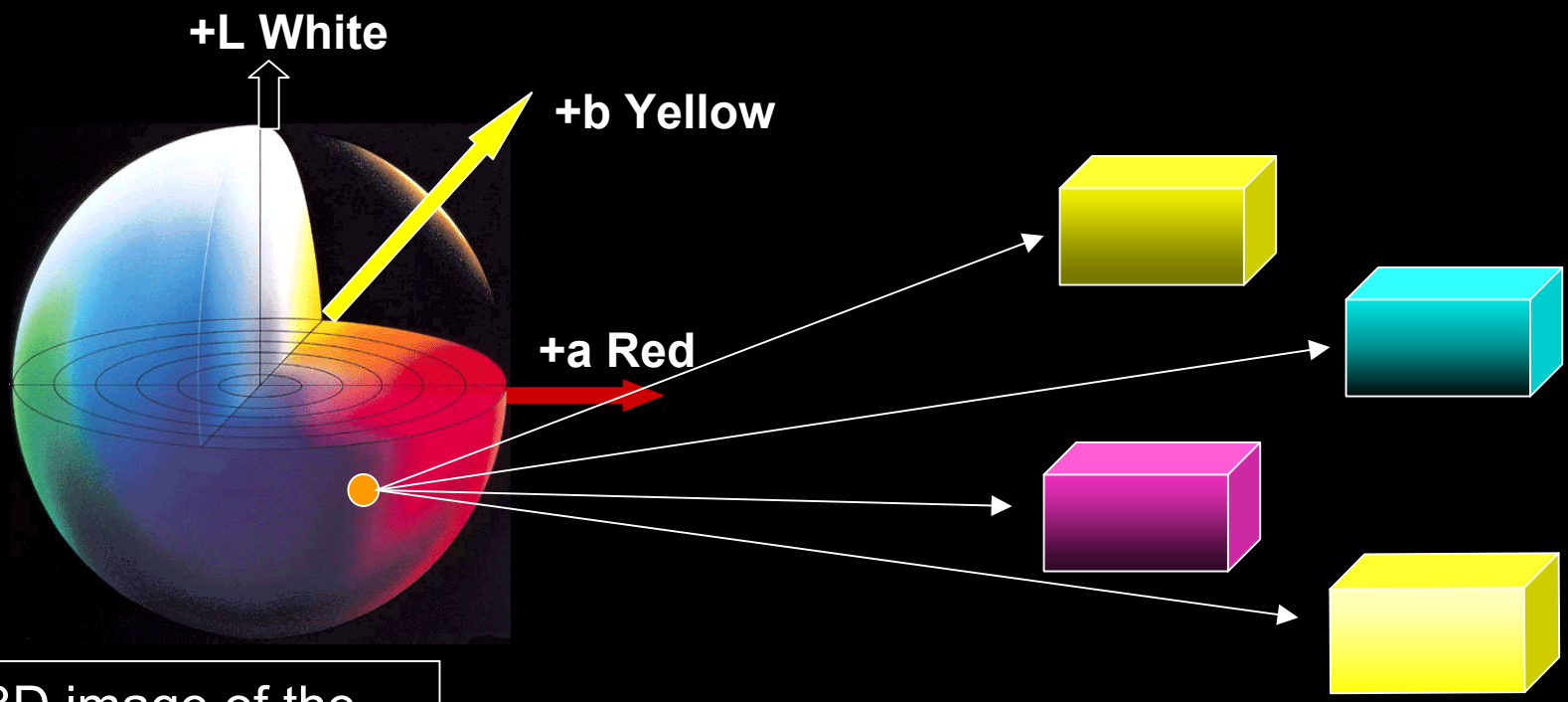
4.3 Outline of the PIC Section



4.4 PIC Image Processing Flow



4.4.1 Color Correction (1)



3D image of the L*a*b* color space

This color conversion system uses a positioning and selection operation to determine where the RGB (L*a*b*) colors will be placed in each of the CMYK colors.

Color Correction (2)

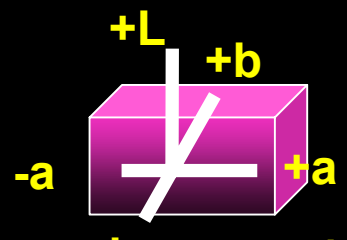
RGB

Lab

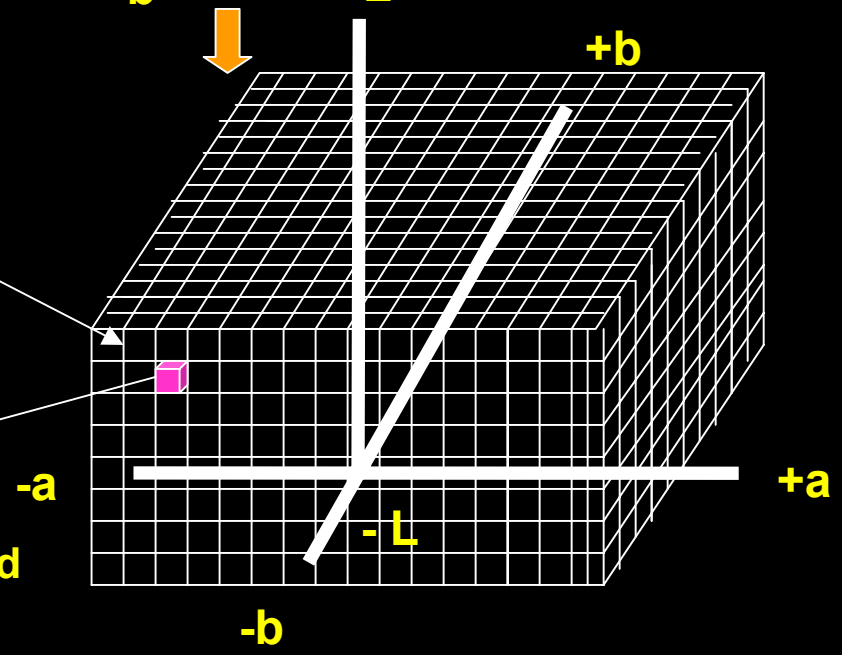
Most significant bit

Least significant bit

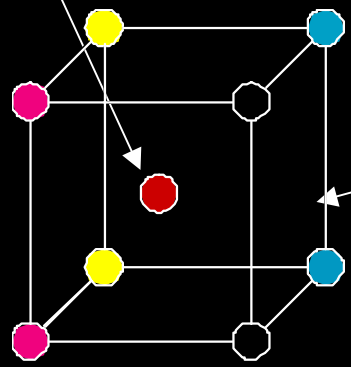
The most significant bit determines the cube's position.



The color space is divided into approx. 2,000 cube positions.



3D Look-up Table



Enlarged view

8-vertex interpolation

The data of the eight vertexes and the least significant bit of the input L*a*b* data are interpolated to calculate the output of the CMYK density data.

4.4.2 GBTC Compression/Expansion

GBTC: General Block Truncation Coding

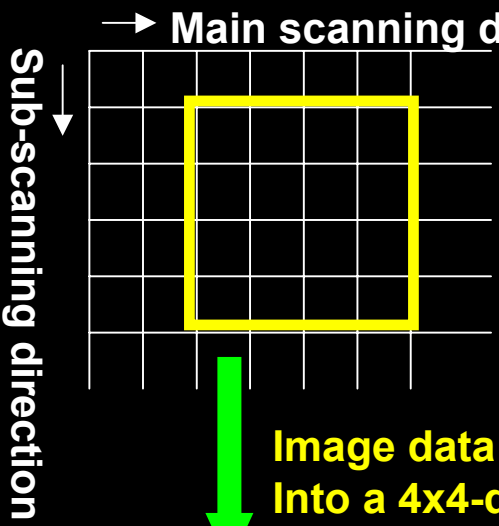


Image data is divided
Into a 4x4-dot section

D0	D1	D2	D3
D4	D5	D6	D7
D8	D9	Da	Db
Dc	Dd	De	Df

4dots

4dots

GBTC Compression

4×4×9bit =144bit

D0	D1	D2	D3
D4	D5	D6	D7
D8	D9	Da	Db
Dc	Dd	De	Df

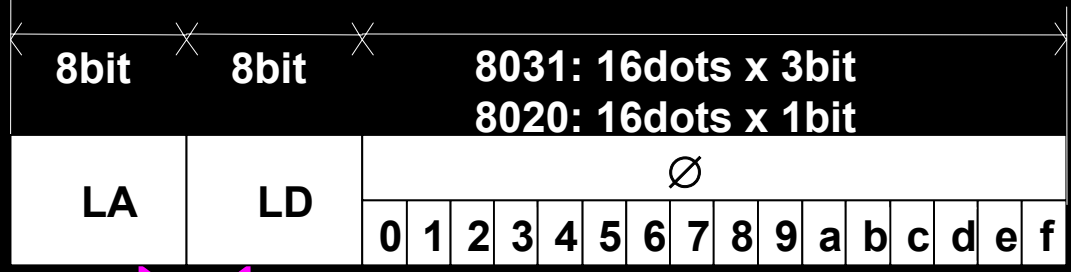
4dot

4dot

4×4×9bit =144bit

GBTC Expansion

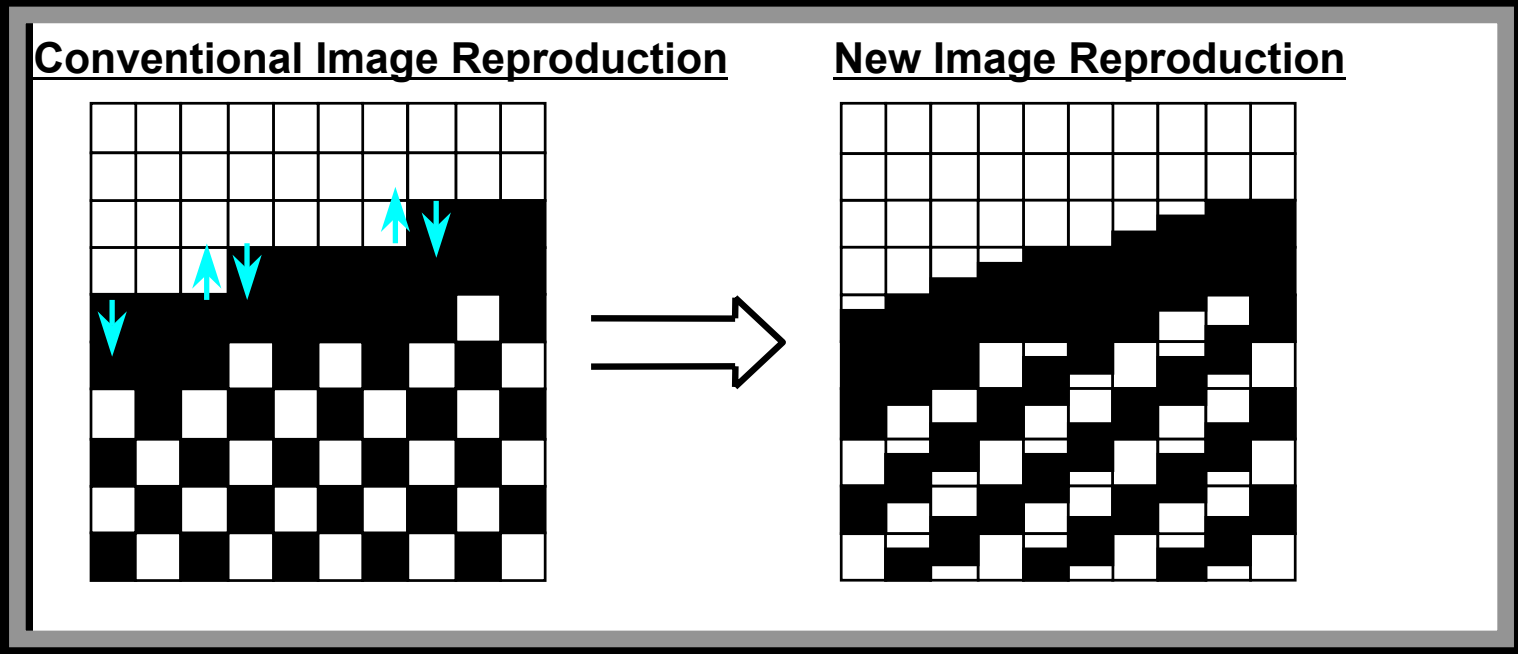
8031: 8bit+ 8bit + 4×4×3bit =64bit
8020: 8bit+ 8bit + 4×4×1bit =32bit

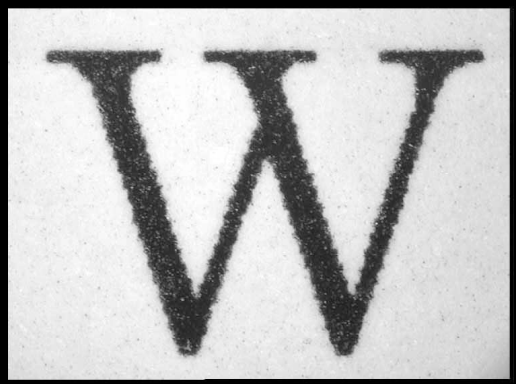


(1) Calculates the maximum and minimum gradation levels.
(2) Calculates the average data, gradation dynamic range, and quantization reference.
(3) Quantizes each pixel to 1 bit (8020) or 3Bits (8031).

4.4.3 FEET Processing

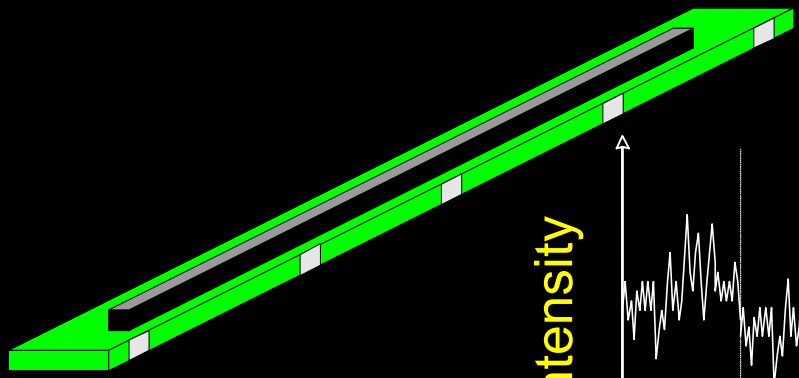
FEET: Fine Edge Enhanced Technology

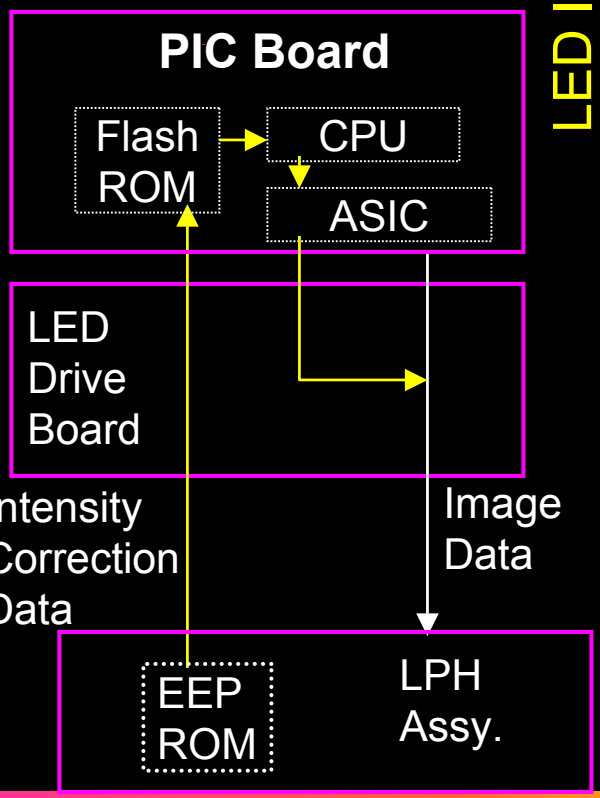


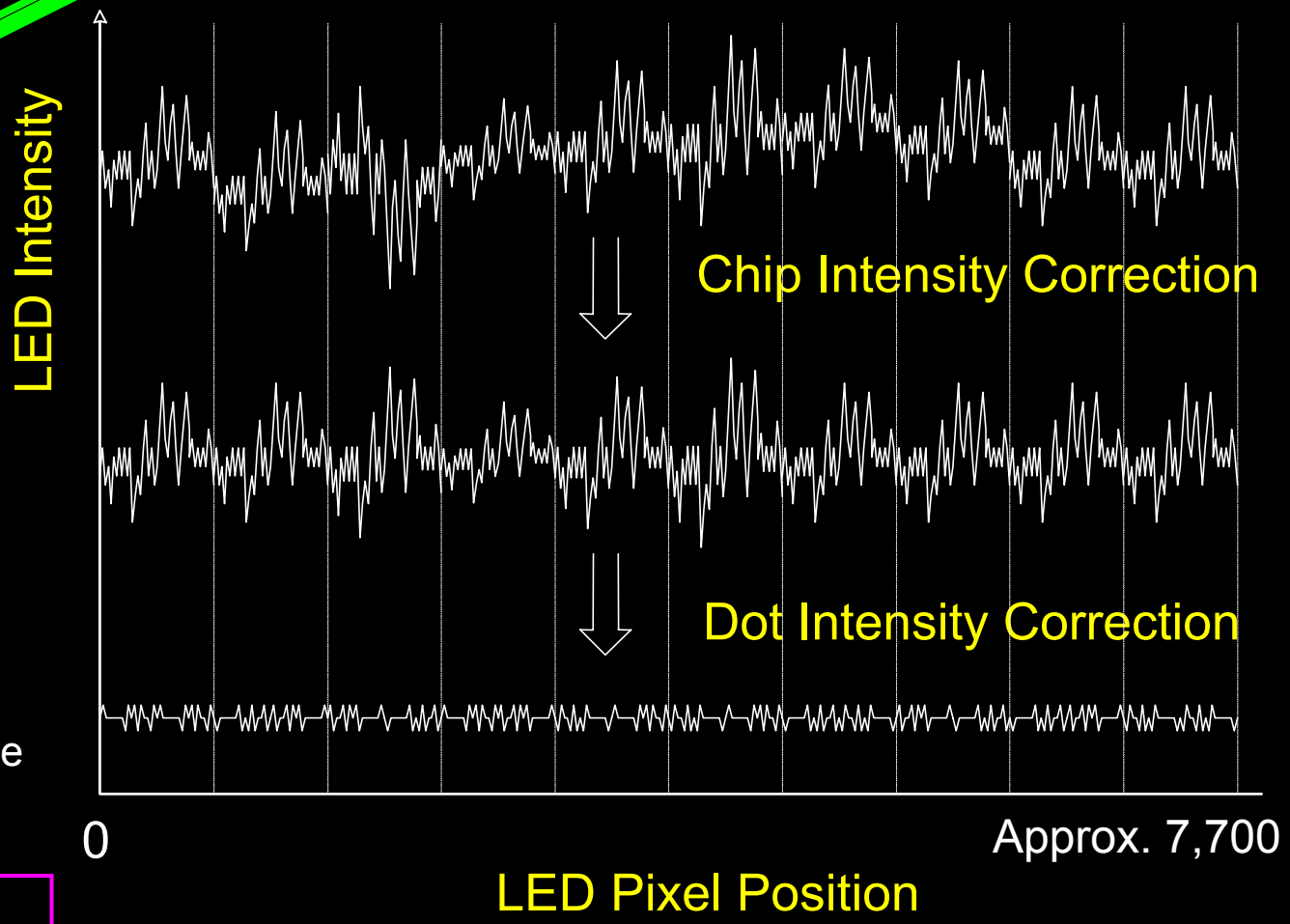




4.4.4 Intensity Correction

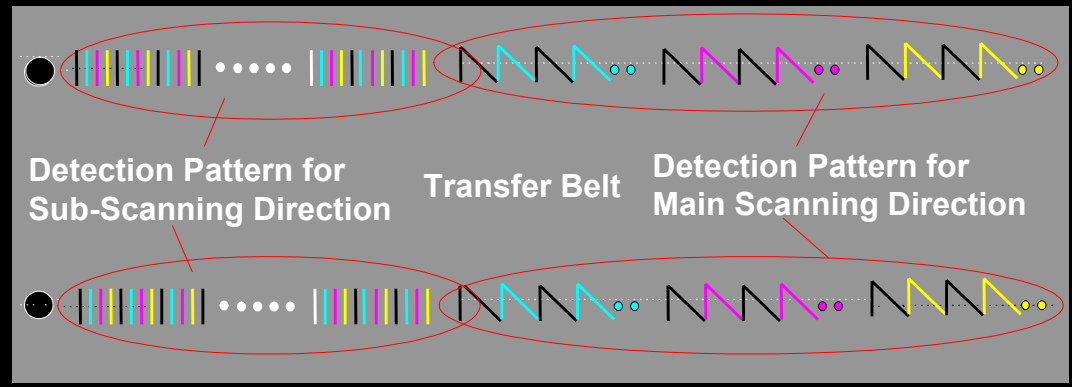


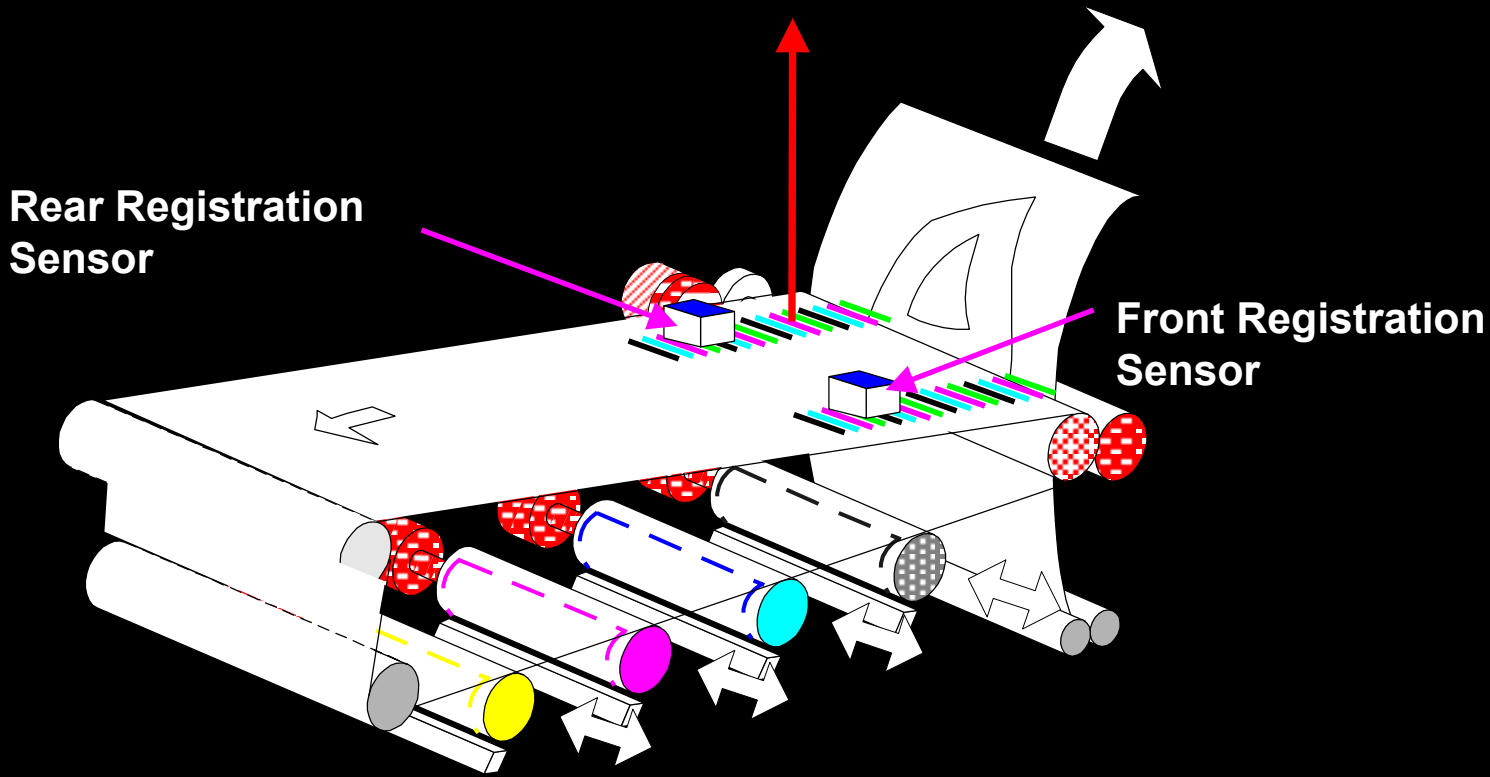




4.5 Color Shift Correction System (1)

Outline of the Color Shift Correction





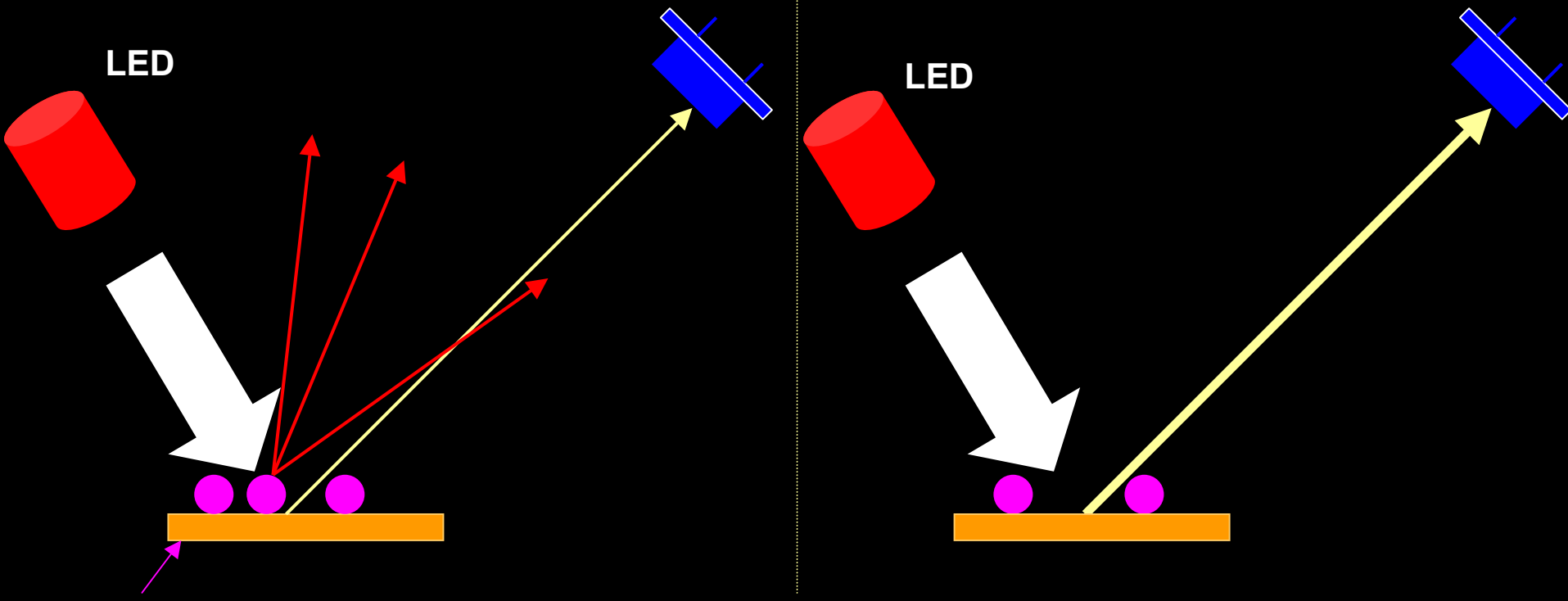
Color Shift Correction System (2)

Construction of the Sensor

Amount of toner Attracted

Large Amount

Small Amount

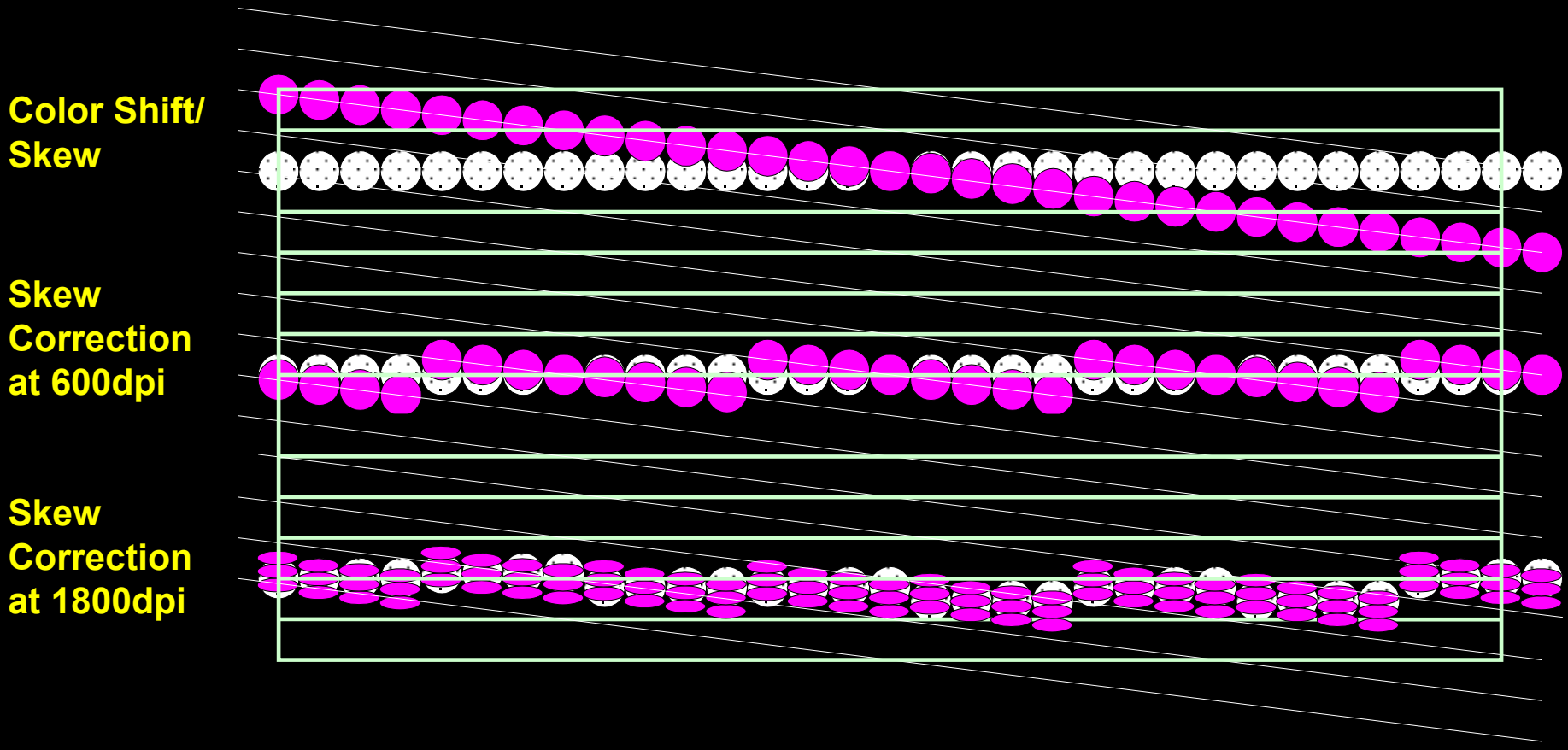


Transfer Belt

	Amount of toner Attracted	Reflected Light Intensity	Output
Color Toner	Large	Low	Low
	Small	High	High

4.5.1 Color Shifting/Skew Correction

As the results of Color Shifting Detection, any skew in the Sub-Scanning direction is corrected with reference to the black image. (The address of the pixels is controlled over the different scanning directions)



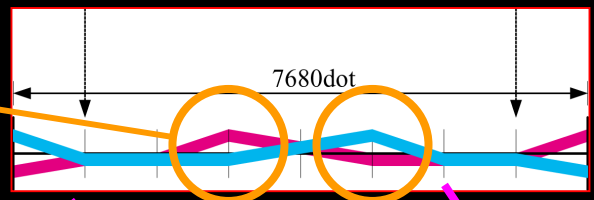
4.5.2 LPH Linearity Correction

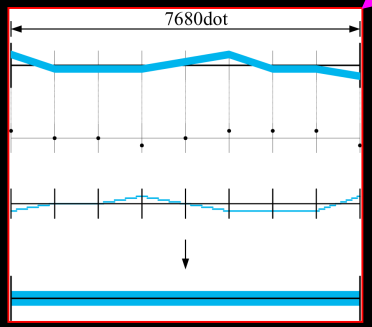
Color Shifting Sample: C & M

Position of the Registration Sensor

Position of the Registration Sensor

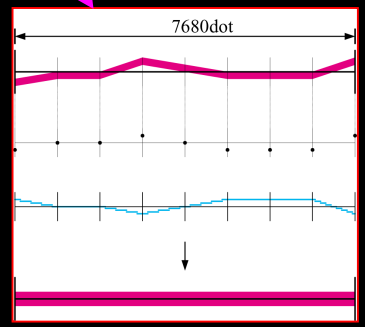
Cause of Color Shifting





Result measured at 120 points

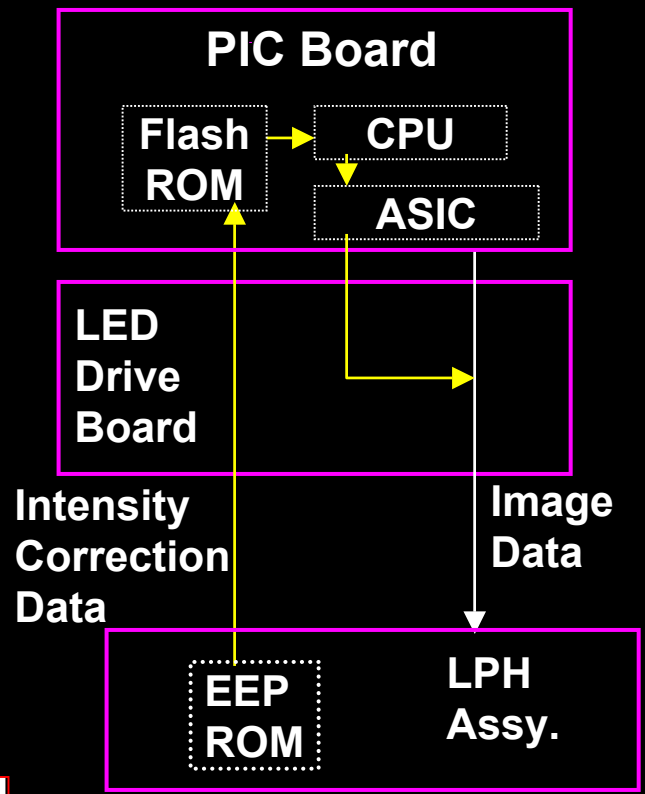
Correction Data is stored in EEPROM



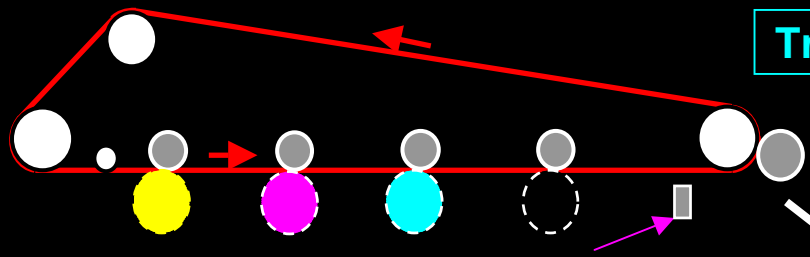
Printing after operating LPH Linearity Correction



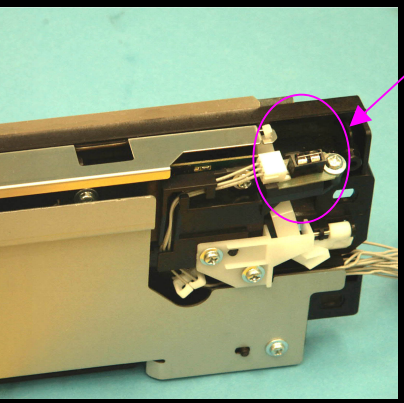
Correction Data Flow



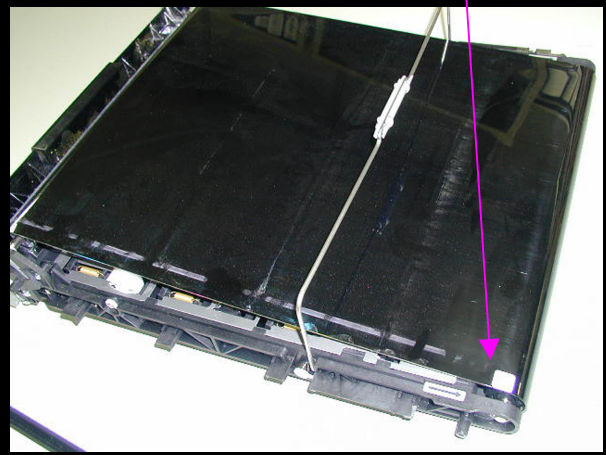
4.5.3 Correction of the Transfer Belt Rotation Speed



Transfer Belt Reference Position Sensor



Reference Position Mark for the Belt

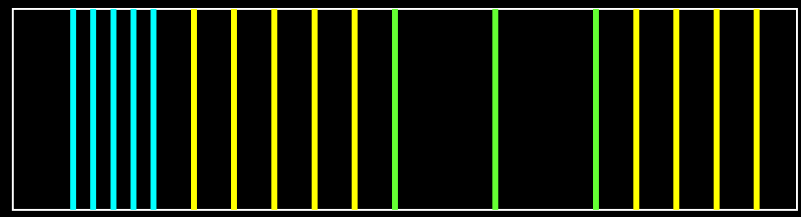


Transfer Belt is thin

Transfer Belt is thick

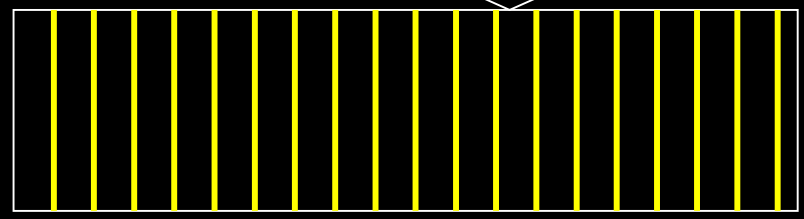
Slow

Fast



Longer Exp. Time

Shorter Exp. Time



Uniform (Divided into 224 portions)