# Color Line Scan Camera Instruction Manual

## Model: TLC-7300UCL

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## The Brief History of Takenaka System Co.

Takenaka System Co.(Trade mark:TAKEX) is the Japan's first company to have produced the Line scan cameras. It was established in 1975 and began to produce and sell the Line scan cameras that year.
And then, Takenaka System Co. is continuing to produce high quality line scan cameras such as C-MOS/ CCD Line scan cameras, CCD Analog line scan cameras, CCD Digital line scan cameras and CCD Camera Link line scan cameras, as a pioneering company in the Japanese industry,.
Also, Takenaka System Co. began to produce the compact CCD video cameras since 1983, and is a first producer of Progressive scan cameras for industrial use in Japan.
We think it is a mission of our company to continue to provide the high-quality Line scan cameras and Progressive scan cameras to the industry as image input device for image processing apparatus.
We are confident that the Takenaka's products that met the strict delivery criteria are assured of trouble-free operation over a long period of time.

Table of Contents

# 1. Outline

TLC-7300UCL is the color line scan camera with 3-lines (RGB) of 7300-pixels CCD image sensor and has the following features.

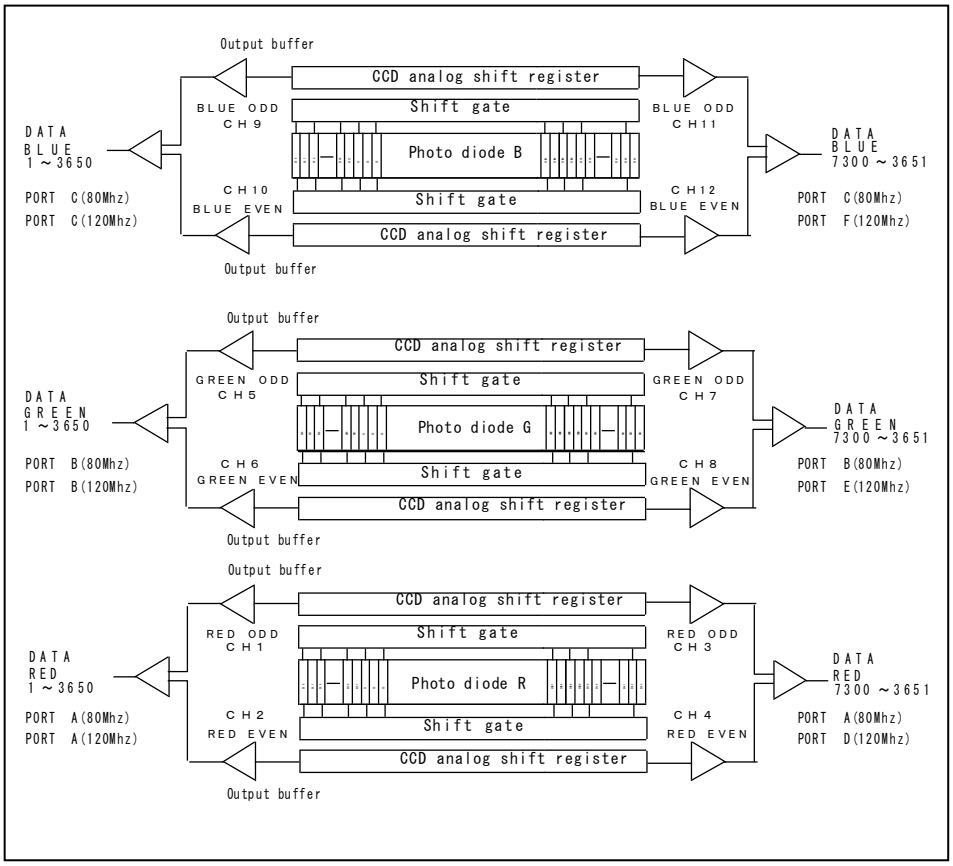
# 2. Features

- Capable of performing high-resolution inspection with 7300-pixels CCD image sensor.
- The pixel size is large enough (10μm×10μm) to capture high S/N images
- The high speed operation at 120MHz data rate (Medium configuration mode) and 80MHz data rate (Base configuration mode).
- Simplified shutter function allows the shutter to operate at 7kHz scan rate in Medium configuration mode.
- Possible to configure various camera settings by means of serial communication via capture board.
- Equipped with Color gap correction function.
- Equipped with FFC function.
- Equipped with White balance function.
- The equipment operates with a single DC12V power source.
- Possible to get stable video signal despite a change of ambient temperature, as the dark current correction circuit is incorporated.
- Reduction in size and weight has been realized by original design

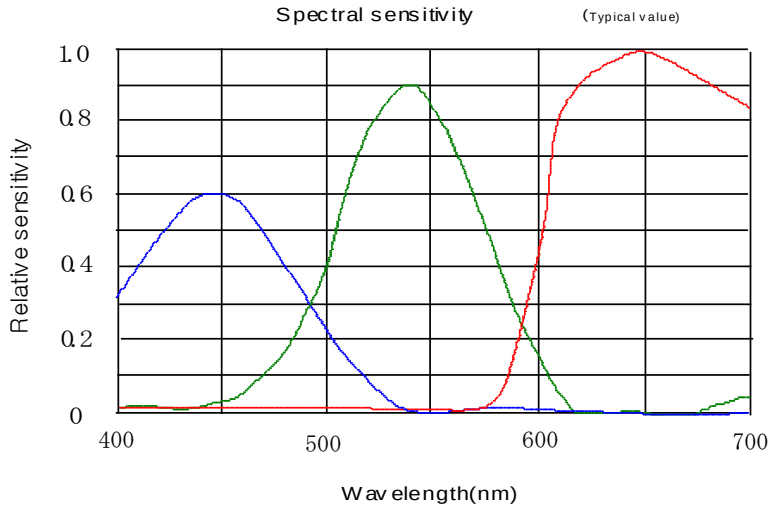
# 3. CCD image sensor

Equipped with High-sensitive and high-speed CCD sensor with 7,300 effective pixels, of which pixel size is 10μm square. Charges accumulated in single-row photo diodes are output through ODD and EVEN analog shift registers respectively. Quad parallel shift registers make it possible to increase transfer efficiency and to obtain high-quality images. CCD transfer frequency is 30MHz.

**Block diagram of CCD device**



**Sensitivity-Wavelength Characteristics**



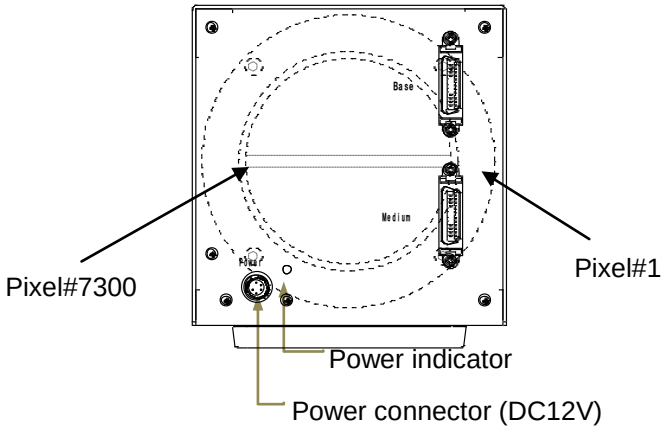

## 4. Specifications

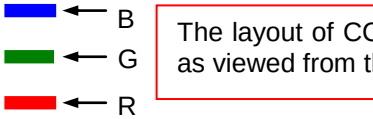
| | | |
|---|---|---|
| Number of pixels | 7300 × 3 lines | |
| Unit cell size | 10μ m×10μ m | |
| Photo array length | 73mm | |
| Video output (Digital output) | 8Bit Base Configuration | 8Bit Medium Configuration |
| Video rate | 80MHz(RGB) each | 60MHz×2(RGB)each |
| Scan rate (scan/sec) | 10KHz | 15KHz |
| Line transfer pulse input | 100μsec(Min) | 66μsec(Min) |
| Sensitivity | 50 V/lx. sec (at Gain setting:1) | |
| Saturated exposure amount | 0.19 lx. sec (on the element) | |
| Output ununiformity | 10% standard<br>at 50% of saturation output<br>(on the element) | |
| Dynamic range | 250 (on the element) | |
| Flange focus | 28.8 mm | |
| Power supply | +12V ±0.5V (1.5A or less) | |
| Operational ambient temperature | 0 ～ +40℃ | |
| Operational humidity range | 85% MAX | |
| Storage temperature range | −10℃ ～ +65℃ | |
| Weight | 720g or less | |
| External dimension (mm) | 108(W)×110(H)×55.5(D) | |
| lens mount | M 80, P = 0.75 mm | |

## 5. Camera I / O

### 5-1 Signal I/O

The line scan camera is connected to the Frame grabber with two Camera Link cables.




The layout of CCD RGB lines as viewed from the rear.

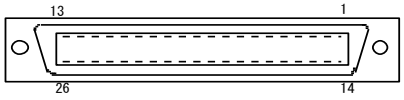
Distance between the lines

Between R-G pixel 40μm

Between G-B pixel 40μm

## 5-2 Camera Link connector

Camera Link connector pin-out




| Signal name | Connection |
|---|---|
| CC1 | EXSYNC |
| CC2 | Spare |
| CC3 | Spare |
| CC4 | Spare |

Base Configuration Connector

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1 | Shield | 14 | Shield |
| 2 | X0- | 15 | X0+ |
| 3 | X1- | 16 | X1+ |
| 4 | X2- | 17 | X2+ |
| 5 | Xclk－ | 18 | Xclk+ |
| 6 | X3- | 19 | X3+ |
| 7 | Ser TC+ | 20 | Ser TC- |
| 8 | Ser TFG- | 21 | Ser TFG+ |
| 9 | CC1- | 22 | CC1+ |
| 10 | CC2+ | 23 | CC2- |
| 11 | CC3- | 24 | CC3+ |
| 12 | CC4+ | 25 | CC4- |
| 13 | Shield | 26 | Shield |

Medium Configuration Connector

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1 | Shield | 14 | Shield |
| 2 | Y0- | 15 | Y0+ |
| 3 | Y1- | 16 | Y1+ |
| 4 | Y2- | 17 | Y2+ |
| 5 | Yclk－ | 18 | Yclk＋ |
| 6 | Y3- | 19 | Y3+ |
| 7 | 100Ω | 20 | terminated |
| 8 | Z0- | 21 | Z0+ |
| 9 | Z1- | 22 | Z1+ |
| 10 | Z2- | 23 | Z2+ |
| 11 | Zclk- | 24 | Zclk+ |
| 12 | Z3- | 25 | Z3+ |
| 13 | Shield | 26 | Shield |

## 5-3 Bit assignment

Base 8 Bit : 1~7300 pixel
Medium 8 Bit : 1~3650 pixel

Unused
7300~3651 pixel

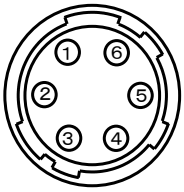
| Base connector | | | |
|---|---|---|---|
| Port/bit | 8-bit | Port/bit | 8-bit |
| Port A0 | R0 | Port B4 | G4 |
| Port A1 | R1 | Port B5 | G5 |
| Port A2 | R2 | Port B6 | G6 |
| Port A3 | R3 | Port B7 | G7 |
| Port A4 | R4 | Port C0 | B0 |
| Port A5 | R5 | Port C1 | B1 |
| Port A6 | R6 | Port C2 | B2 |
| Port A7 | R7 | Port C3 | B3 |
| Port B0 | G0 | Port C4 | B4 |
| Port B1 | G1 | Port C5 | B5 |
| Port B2 | G2 | Port C6 | B6 |
| Port B3 | G3 | Port C7 | B7 |

| Medium connector | | | |
|---|---|---|---|
| Port/bit | 8-bit | Port/bit | 8-bit |
| Port D0 | R0 | Port E4 | G4 |
| Port D1 | R1 | Port E5 | G5 |
| Port D2 | R2 | Port E6 | G6 |
| Port D3 | R3 | Port E7 | G7 |
| Port D4 | R4 | Port F0 | B0 |
| Port D5 | R5 | Port F1 | B1 |
| Port D6 | R6 | Port F2 | B2 |
| Port D7 | R7 | Port F3 | B3 |
| Port E0 | G0 | Port F4 | B4 |
| Port E1 | G1 | Port F5 | B5 |
| Port E2 | G2 | Port F6 | B6 |
| Port E3 | G3 | Port F7 | B7 |

## 5-4 Power connector

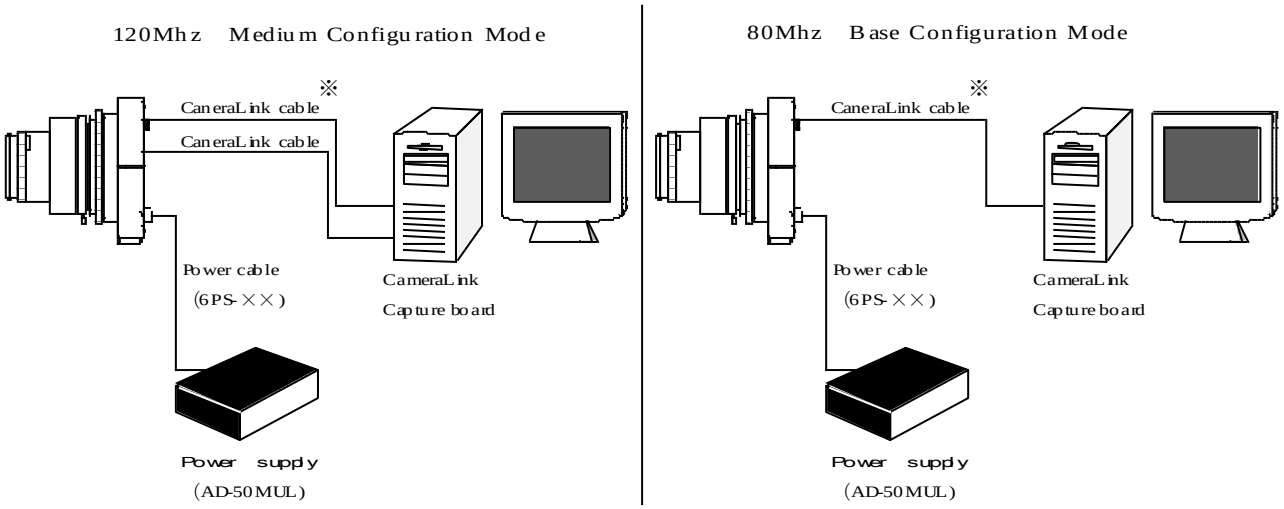
Power connector pin assignment

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1 | + 1 2 V | 4 | G N D |
| 2 | + 1 2 V | 5 | G N D |
| 3 | + 1 2 V | 6 | G N D |




Conforming connector
HR 10A-7R-6PB

# 6. Connection Diagram




※CameraLink cable

14B26-SZLB-＊00-0LC （Medium/Full Cofig. Standard type）

＊ represents cable length(m)

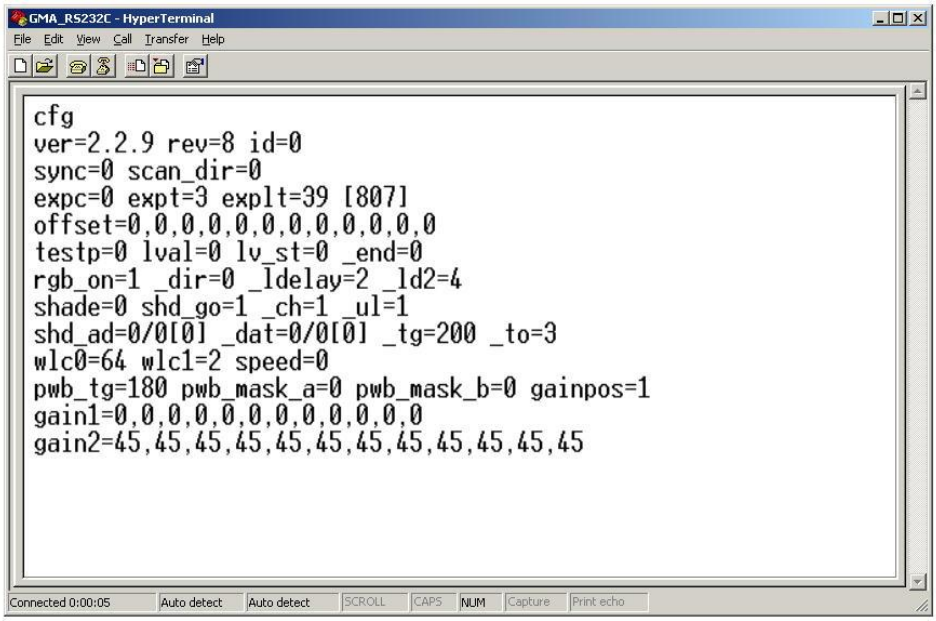
# 7. Initial setting

The following settings can all be made by communication command of Hyper terminal (See P.20-22).
Make the setting according to TLC-7300UCL_RS232C communication protocol (P.18-19)

At Hyper terminal

Command

cfg <CR> To get the internal settings of the camera.




## 7-1 Operational setting of the camera

### 7-1-1 Synchronization setting

Sync=N <CR> To set the camera SYNC mode.

0: Auto mode (Ext/Int Sync)
1: Ext Sync (External synchronization)
2: Int Sync (Internal synchronization)
3: Ext Sync & Anti Blooming (External synchronization)

### 7-1-2 Exposure mode setting

expc= N <CR> To set the Exposure control mode.

0: Line period exposure
1: Fixed time exposure (value of expt & explt)
2: Pulse width exposure

(Refer to Exposure control for the detail)

expt= A <CR> To set the Exposure time of the camera (in 256 clks).

explt= B <CR> To set the Exposure time of the camera (in clk).

A=0 to 255 B=0 to 255

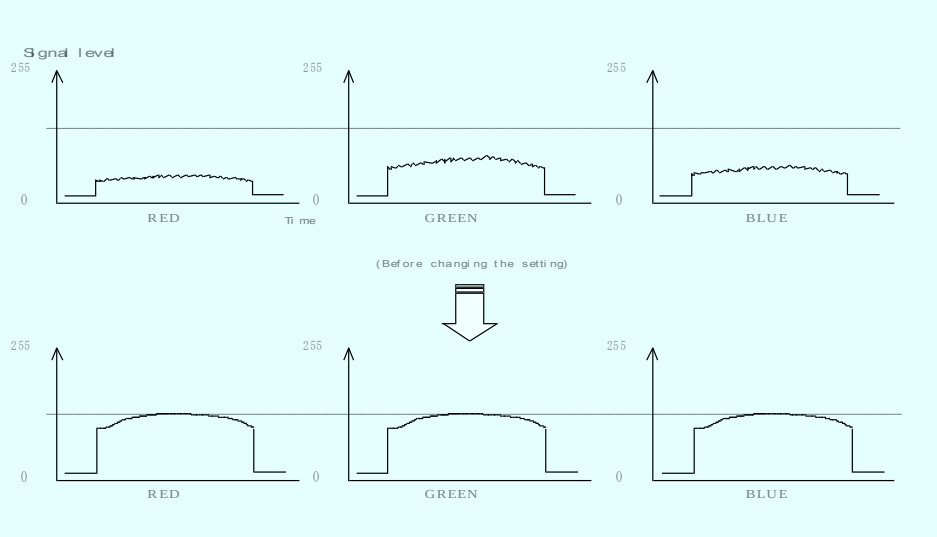
Exposure time : expt x 256 + explt [clk] (1clk=33.33ns)

80MHz mode minimum value expt=3, explt= 39

※ “expc = 1"is disabled when "sync=0".
※ “expc = 0"is disabled when "sync=3".

7-2 White balance setting

This is the function to adjust ODD/EVEN levels and to achieve white balance.
White balance should be adjusted before executing FFC function.




<Setup steps>

The gain position can be specified in white balance setting.
The gain values are set in the specified gain position.

| | | |
|---|---|---|
| pwb_tg=0 | <CR> | To set the analog gains of all RGB channels to minimum.<br>Minimum value = 1 |
| pwb_set | <CR> | To achieve a white balance . |
| pwb_tg=N | <CR> | To set the target level of white balance.<br>Default value =180 N : 0 to 255 |

Take a defocused image of a surface of a plain white paper.
Check if it is not fogged by halation for each RGB line.
Use the stable illumination light source.

| | | |
|---|---|---|
| pwb_set | <CR> | To start to achieve a white balance.<br>Completed when “OK” is displayed. |
| save | <CR> | To save the settings into EEPROM.<br>Completed when “OK” is displayed. |

<Confirmation of settings>

| | | |
|---|---|---|
| cfg | <CR> | To get the internal settings of the camera. |

```
pwb_tg=180 pwb_mask_a=0 pwb_mask_b=0 gainpos=1
gain1=0,0,0,0,0,0,0,0,0,0,0,0
gain2=45,45,45,45,45,45,45,45,45,45,45,45
```

↑ Settings before achieving a white balance.
Settings in gain position1 will be changed in this case.

White balance is achieved according to the above <Setup steps>.

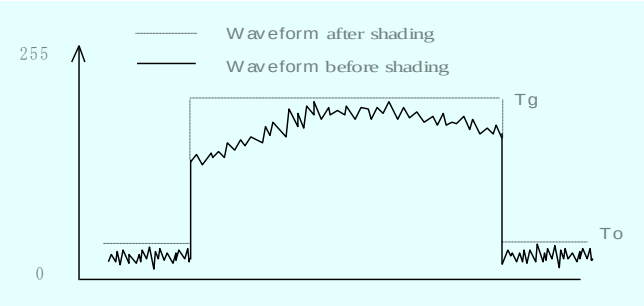
| | | |
|---|---|---|
| cfg | <CR> | To get the internal settings of the camera. |

⇩ Check if the gain values in the specified gain position has been definitely changed.

```
pwb_tg=180 pwb_mask_a=0 pwb_mask_b=0 gainpos=1
gain1=195,193,194,190,151,157,153,163,219,219,217,217
gain2=45,45,45,45,45,45,45,45,45,45,45,45
```

7-3 FFC Function setting

Flat field correction (also called Shading Correction) is a function used to compensate for shading of an image signal arising from imperfections or inhomogeneities of lens or picture/filter elements .




- ◆ Light level (shd-tg) setting 8bit
- ◆ Dark level (shd-to) setting 8bit

<Setup steps>

1. Dark level correction

| | | |
|---|---|---|
| shade=0 | <CR> | To turn the FFC function off.<br>To reset the shading gain value stored in the camera. |
| shade=4 | <CR> | To permit to enter the shading data. |
| shd_go=1 | <CR> | To select the shading gain setting mode |
| shd_dat=0 | <CR> | To enter “0” as the shading gain value |
| shd_set | <CR> | To set the shading data. |
| shd_to=N | <CR> | To set the target Dark level.<br>Default value = 3 N : 0 to 255 |

Then put a cap over a lens.

| | | |
|---|---|---|
| shade = 6 | <CR> | To start the shading correction for Dark level signal.<br>Completed when “OK” is displayed. |

2. Light level correction

Remove a lens cap and set the target gray level of video signal level.
Take a defocused image of a surface of a plain white paper.
Make the signal level adjustment by changing lens aperture or exposure time.
(Note: Make sure a foreign object does not exist within the visual field.)

| | | |
|---|---|---|
| shd_tg=N | <CR> | To set the target Light level.<br>Default value =150 N : 0 to 255<br>(Set the target Light level to the level that is higher than the signal level before Light level correction.) |
| shade = 5 | <CR> | To start the shading correction for Light level signal.<br>Completed when “OK” is displayed.<br>Then, a flat gray image is obtained. |
| shd_epsv | <CR> | To save all shading correction values into EEPROM.<br>Completed when “OK” is displayed. |
| shade=1 | <CR> | To turn the shading correction function on. |
| save | <CR> | To save the system settings into EEPROM.<br>Completed when “OK” is displayed. |

3. Confirmation of shading data

Each pixel data are output as a video output by configuring the settings below

Confirmation of shading gain value

1. shd_go=1 <CR> To select the shading gain setting mode(Light level coefficient)
2. shade=2 <CR> To permit to output the shading data.
3. shd_ul=N <CR> Upper /lower bit switching. N: 0(upper 8bit) or 1(lower 4bit).
4. Shading gain values of each pixel are output as video output.

Confirmation of shading offset value

1. shd_go=2 <CR> To select the shading offset setting mode(Dark level coefficient)
2. shade=2 <CR> To permit to output the shading data
3. shd_ul=N <CR> Upper /lower bit switching. N: 0(upper 8bit) or 1(lower 4bit).
4. Shading offset values of each pixel are output as video output.

4. Direct entry of shading data

Entry of shading gain value

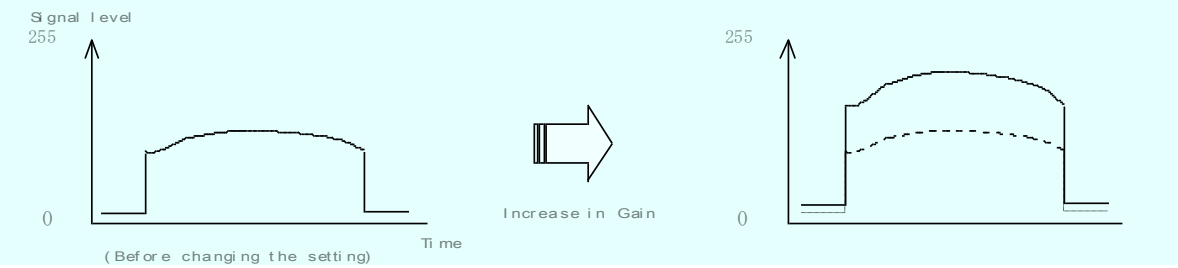
1. shd_go=1 <CR> To select the shading gain setting mode(Light level coefficient)
2. shade=3 <CR> To permit to input the shading data
3. shd_ad1=M <CR> To enter the pixel address
   shd_ad0=N <CR> pixel address: M x 256 + N
   Pixel address starts from 0.
4. shd_dat=N <CR> To enter the upper 8bit data. N: 0 to 255.
5. shd_dat1=N <CR> To enter the lower 4bit data. N: 16 to 240.
6. shd_set <CR> To enter the shading data.
7. Repeat step 3 to 6 when entering the shading data of another pixel.
8. shade=1 <CR> To turn FFC function(Shading function) ON.

Entry of shading offset value

1. shd_go=2 <CR> To select the shading offset setting mode(Dark level coefficient)
2. shade=3 <CR> To permit to input the shading data
3. shd_ad1=M <CR> To enter the pixel address
   shd_ad0=N <CR> pixel address: M x 256 + N
   Pixel address starts from 0.
4. shd_dat=N <CR> To enter the upper 8bit data. N: 0 to 255.
5. shd_dat1=N <CR> To enter the lower 4bit data. N: 16 to 240.
6. shd_set <CR> To enter the shading data.
7. Repeat step 3 to 6 when entering the shading data of another pixel.
8. shade=1 <CR> To turn FFC function(Shading function) on.

7-4 Analog gain control

This is the function to adjust an analog gain by setting a total of 12 channels (Red 4,Green 4, Blue 4). Two sets of analog gain values can be stored in two gain positions.

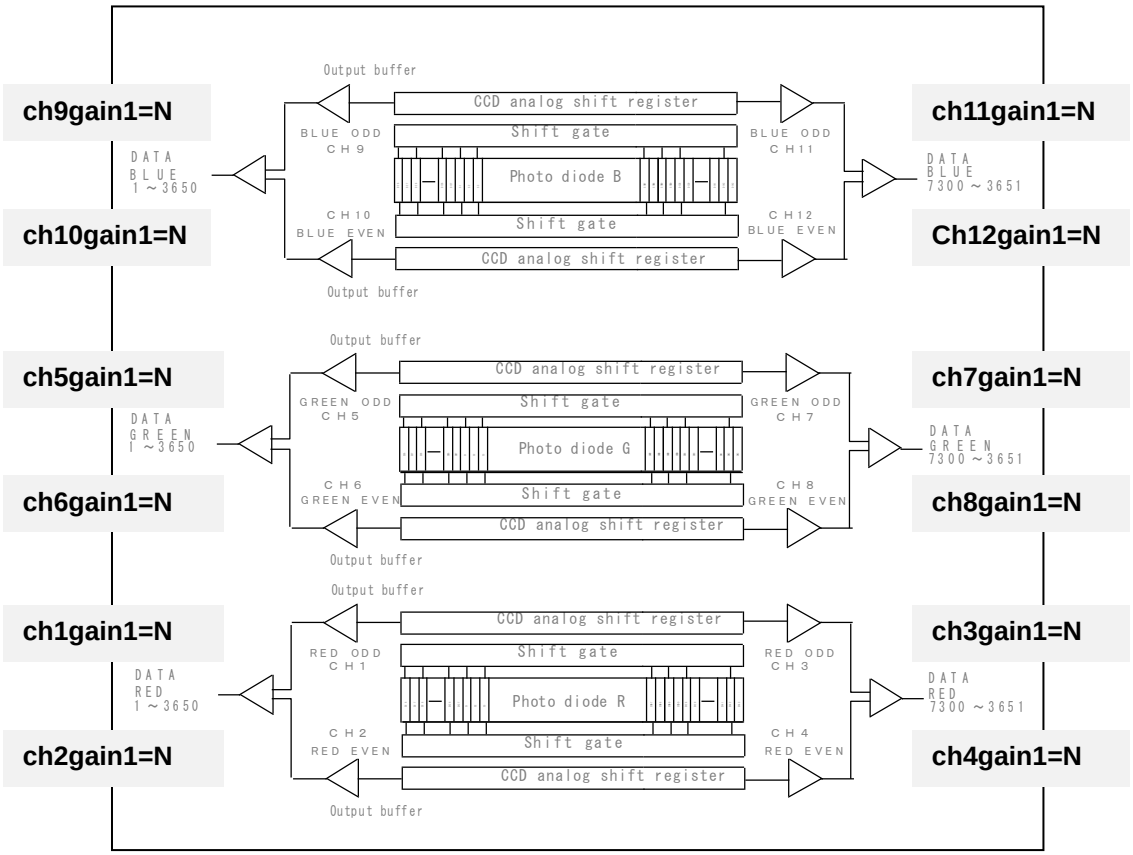



<Setup steps>

chXgainA = N <CR> To specify the channel to change the analog gain.

Gain channel X = 1 to12
Gain position A = 1, 2
Gain adjustment range N = 0 to1023

Analog Gain = -6 dB + 0.04 dB × N



7-5 Color gap control

This is the function to correct the color gap by delaying the output timing of two lines (Red□ Green or Green□Blue).

<Setup steps>

rgb_on = 1 <CR> To enable color gap correction.
0 : OFF 1 : ON

rgb_dir = 0 <CR> To select a direction for correction.
0 : R → G → B
1 : B → G → R

rgb_ldelay = N <CR> To set the correction amount (line numbers) for the second line.
N = 0 to 8

rgb_ld2 = N <CR> To set the correction amount (line numbers) for the third line.
N = 0 to 8

Example: rgb_dir = 0 and the delay amount between adjacent lines is 2 lines.
rgb_ldelay = 2 & rgb_ld2=4
Red delay lines : 4 lines (rgb_ld2)
Green delay line : 2 lines (rgb_ldelay)
Blue delay lines : 0 line

7-6 Data rate setting

This is the function to switch the video output mode between "80MHz Base Configuration" and "120MHz Medium Configuration".

<Setup steps>

1. The data rate 80MHz [Base Configuration] mode.

scan_dir = 2 <CR>

speed = 1 <CR>

2. Data rate 120MHz [Medium Configuration] mode

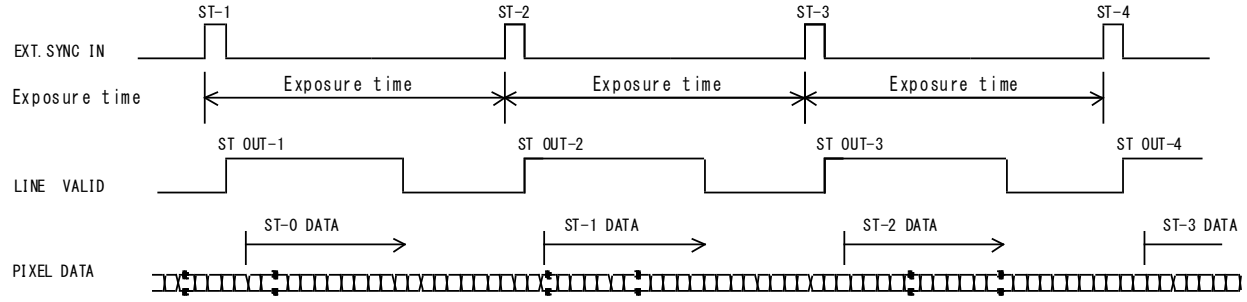
scan_dir = 0 <CR>

speed = 0 <CR>

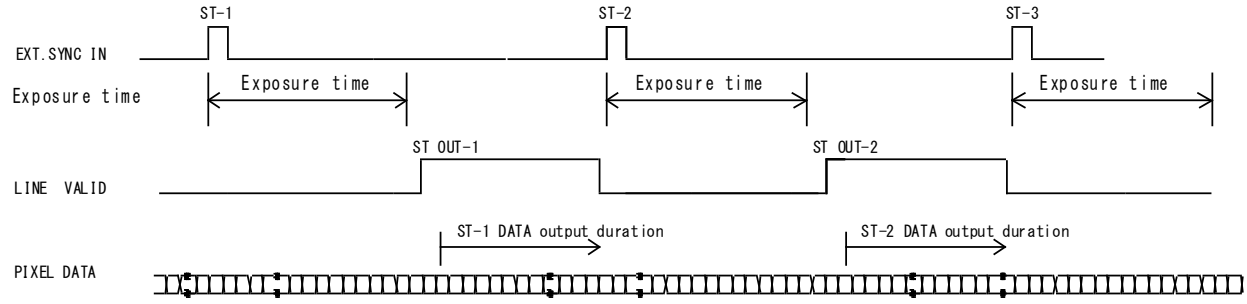
# 8. Exposure Control

## TLC-7300UCL External SYNC (sync=1)

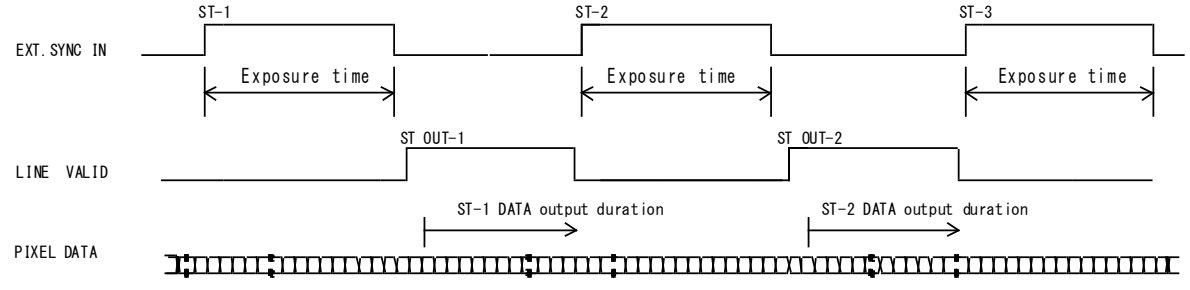
**Line period exposure** (sync=1, expc=0)
Exposure during each period of EXT.SYNC(CC1)




**Fixed time exposure**(sync=1, expc=1, expt=N, explt=A)(sync=3, expc=1, expt=N, explt=A)
Exposure during the period of the equation below from the timing of leading edge of EXT.SYNC(CC1).
Exposure time=66.7 + (N × 256 + A)0.033 (μsec)
Minimum exposure time=66.7μsec
* Note that the minimum period of EXT.SYNC is 133.4μsec in
Minimum period=66.7μsec+DATA output duration(66.7μsec)



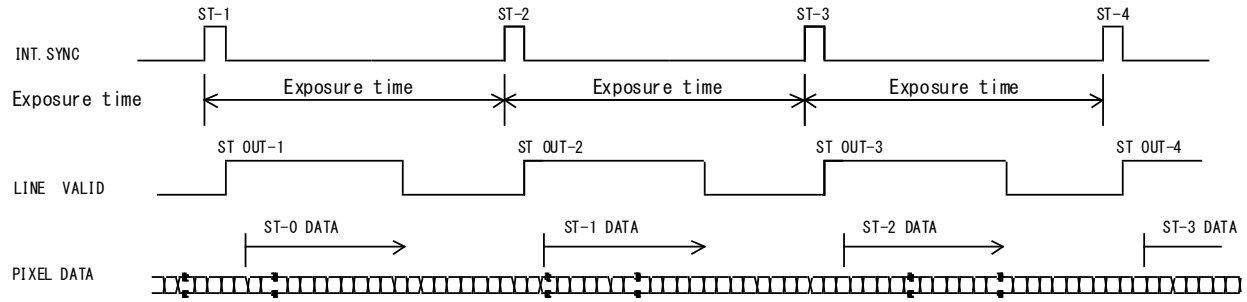

**Pulse width exposure** (sync=1, expc=2)(sync=3, expc=2)
Exposure during the period of the pulse width of EXT.SYNC(CC1).
Mimimum exposure time=66.7μsec
* Note that the minimum period of EXT.SYNC is 133.4μsec in the Pulse width exposure mode.
Minimum period=66.7μsec+DATA output duration(66.7μsec)



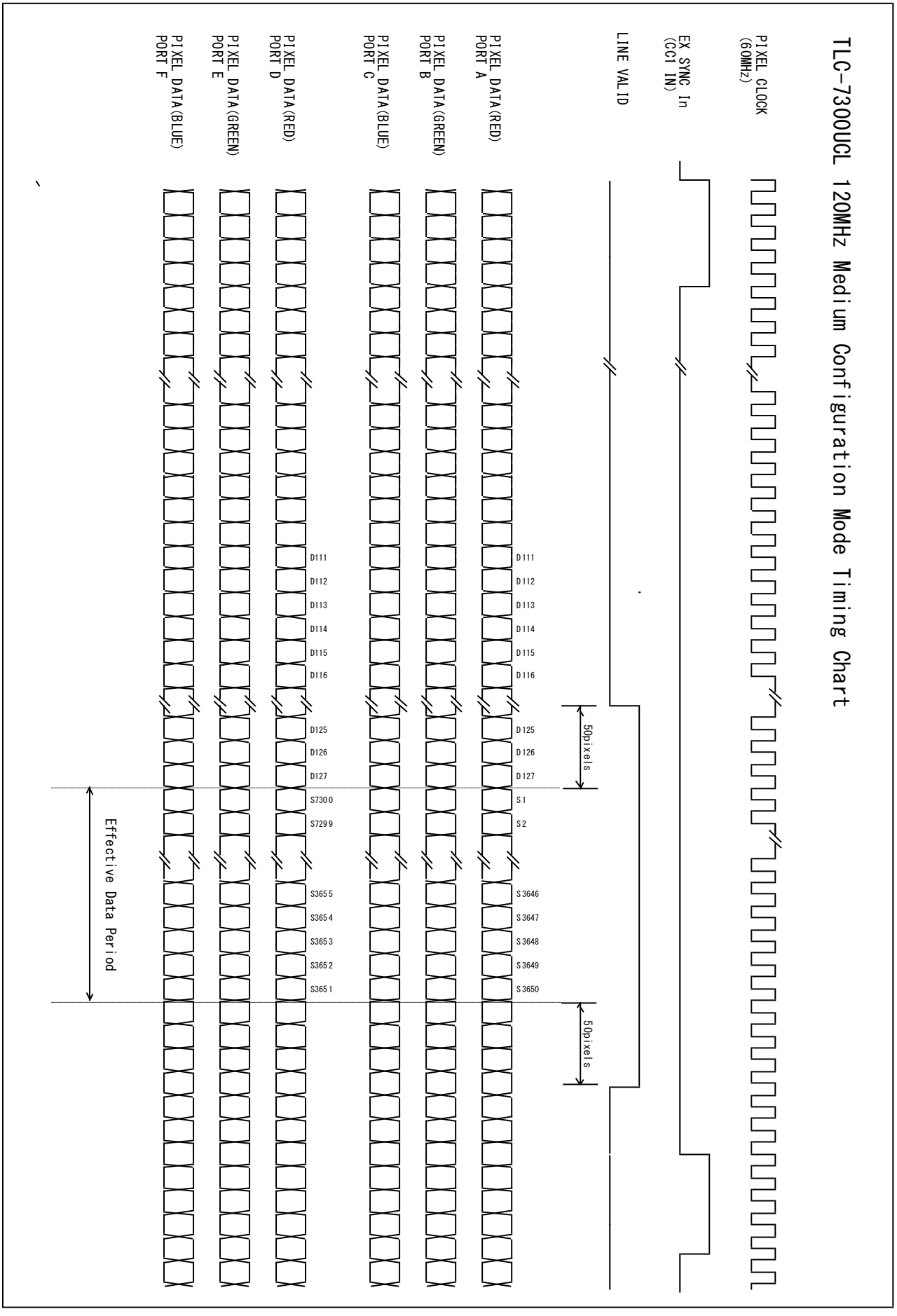
## TLC-7300UCL Internal SYNC (sync=2)

**Line period exposure** (sync=1,expc=0)

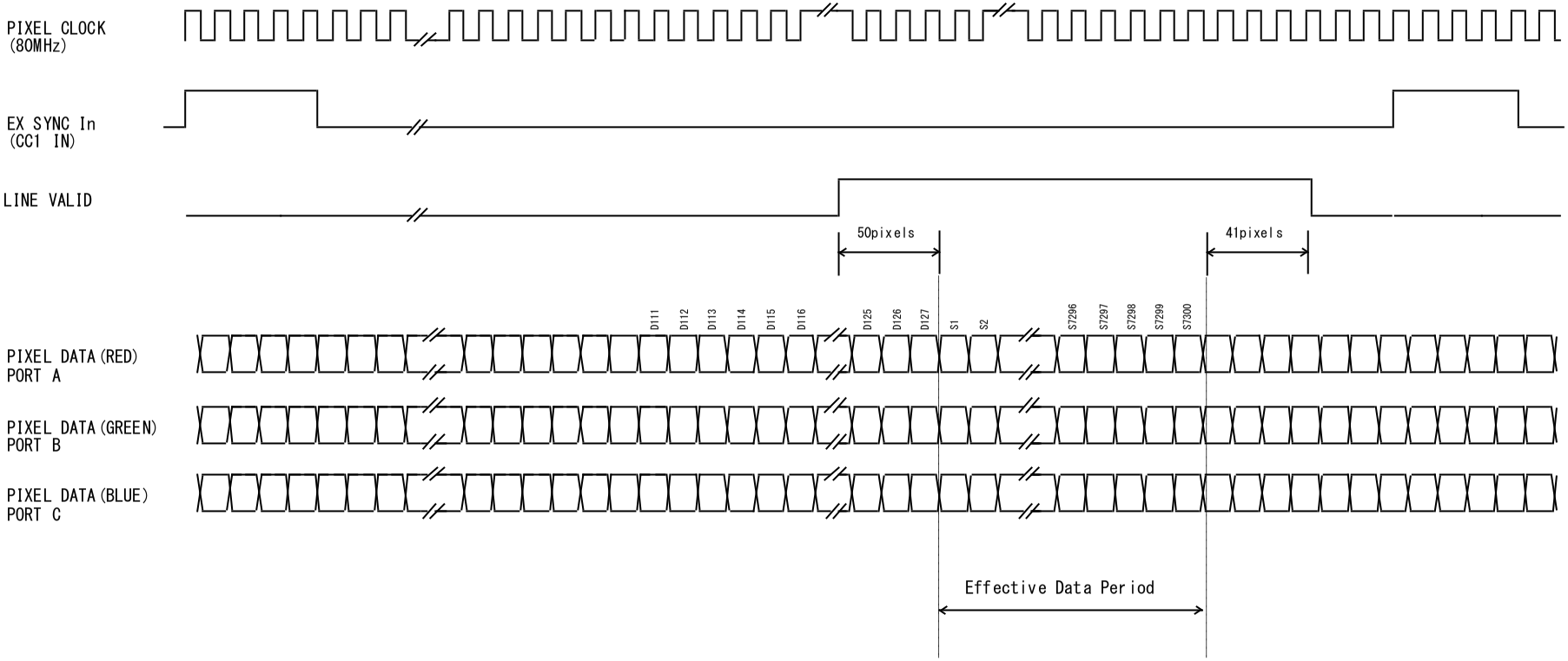
Exposure during each period of EXT.SYNC(CC1)
The line preiod is decided by the value of expt and explt.



9. Timing Chart



## TLC-7300UCL 80MHz Base Configuration Mode Timing Chart



# 10. Serial Communication Protocol

[Network transmission setting]

| | |
|---|---|
| Baud rate | :9600bps |
| Data Length | :8bit |
| Start Bit | :1bit |
| Stop Bit | :1bit |
| Parity | :Non |
| Xon / Xoff Control | :Non |

[Communication overall]

1. Referring

   To refer to the status of the camera.

   e.g. Id? <CR> To refer to the camera ID.

2. Setting

   To set the status of the camera.

   e.g. sync=1 <CR> To set SYNC system to EXT.SYNC

[Glossary]

| | |
|---|---|
| [ ] | ……omissible |
| <CR> | ……carriage return |
| N | ……arbitrary numeral indicating some value |
| A | ……arbitrary numeral indicating GAIN position |
| X | ……arbitrary numeral indicating Channel |
| Gain position | ……GAIN position of the camera |
| Channel | …….Channel to specify the GAIN control device for each CCD output line |
| EEPROM | …….EEPROM incorporated in the camera |

[Notes]

- Command name must be lower-case. Upper-case character is not valid.
- Input character must be one-byte character. Double-byte character is not valid.
- Blank is not valid.
- Line feed code is indicated by “CR(0x0D)”. And also “LF(0×0A)” and “CR+LF” are usable. However returning line feed code must be CR only.

<When using Hyper terminal>

- Retyping is required In case of inputting error.(Correction by cursor movement is not valid.)

[ Description of exceptional case]

* NG is returned in case of command input error or inputting nonexistent command.

e.g. : Command input error (Gain position No. is not designated. )
Input: ch1gain=96
Output: NG

e.g. : Input of nonexistent command
Input: chake
Output: NG

* NE is returned in case of numeric entry error.

e.g. : Input error (Input value is beyond the setting range.)
Input: gainpos=96
Output: NE

e.g. : Input error (Input value is beyond the setting range.)
Input: ch1gain1=2000
Output: NE

* NC is returned in case of inputting invalid value under the condition that the ctrl setting (DIP-SW setting) is 0.

e.g. :
Input: ch1gain=96 (at ctrl=0)
Output: NC

* TO is returned when a command input period overruns the time-out period (15 sec.).

e.g. :
Input: gainpo (No CR entry)
Output: TO

* " ? " at the bottom of Command is omissible

e.g. :
Input: id
Output: 0

| | Command Name | Format | Argument | Return value | Explanation |
|---|---|---|---|---|---|
| User | Get ID<br>*1 | id[?]<CR> | Non | ID(Default:0) | Get the camera ID<br>This is for multiple camera management |
| | Set ID<br>*1 | id=N<CR> | N:0～255 | OK | Set the camera ID<br>This is for multiple camera management |
| Sync selection | Get Sync. | sync[?]<CR> | Non | 0:Auto mode<br>1:Ext Sync<br>2:Int Sync<br>3:Ext Sync(AntiBlooming) | Get the Sync system of the camera |
| | Set Sync. | sync=N<CR> | N=0:Auto mode<br>N=1:Ext Sync<br>N=2:Int Sync<br>N=3:Ext Sync(AntiBlooming) | OK | Set the Sync system of the camera<br>Ext Sync is from CC1. |
| Exposure control | Get Exposure Control | expc[?]<CR> | Non | 0:Line period exposure<br>1:Fixed time exposure<br>2: Pulse width exposure | Get the Exposure control status |
| | Set Exposure Control | expc=N<CR> | N=0:Line period exposure<br>N=1:Fixed time exposure<br>N=2: Pulse width exposure | OK | Set the Exposure control status |
| Exposure time | Get Exposure Time | expt[?]<CR><br>explt[?]<CR> | Non | 0-255:Exposure time | Set the Exposure time |
| | Set Exposure Time | expt=N<CR><br>explt=N<CR> | N=0-255:Exposure time | OK | Get the Exposure time |
| Gain | Get Gain Position | gainpos[?]<CR> | Non | 1-2:Gain position | Get the Gain position |
| | Set Gain Position | gainpos=A<CR> | A=1-2:Gain position | OK | Set the Gain position |
| | Get chXgainA | chXgainA[?]<CR> | X=1-12:ch<br>A=1-2:Gain position | 0-255:Gain level | Get the Gain level of each gain postion of each channel |
| | Set chXgainA | chXgainA=N<CR> | X=1-12:ch<br>A=1-2: Gain position<br>N=0-255: Gain level | OK | Set the Gain level of each gain postion of each channel |
| Color Gap | Color gap control on/off | rgb_on=N<CR> | 0:OFF<br>1:ON | OK | Color gap control on/off value setting |
| | | rgb_on[?]<CR> | Non | 0:OFF<br>1:ON | Color gap control on/off value reference |
| | Color gap dir | rgb_dir=N<CR> | 0:RGB<br>1:BGR | OK | Color gap scan direction value setting |
| | | rgb_dir[?]<CR> | Non | 0:RGB<br>1:BGR | Color gap scan direction value reference |
| | Color gap line | rgb_ldelay=N<CR> | N:0-8 | OK | Color gap delay lines value setting |
| | | rgb_ld2=N<CR> | N:0-16 | OK | |
| | | rgb_ldelay[?]<CR> | Non | 0-8 | Color gap delay lines value reference |
| | | rgb_ld2[?]<CR> | 0-16 | OK | |
| System | Check | check<CR> | Non | OK | Communication test |
| | Save | save<CR> | Non | OK | Save settings to the EEPROM |
| | Load | load<CR> | Non | OK | Load settings from the EEPROM |
| | Version | ver<CR> | Non | Version | Get the version number of the program for the microcomputer control |
| | Revision | rev<CR> | Non | Revision | Get the version number of FPGA |
| | Initialize | init<CR> | Non | OK | Load the factory settings |
| | config | cfg<CR> | Non | (Data output) | Get the all current settings |

*1…ID can be saved on the user area of the EEPROM by the save command. It cannot be cleared by the clear command.

| | Command Name | Format | Argument | Return value | Explanation |
|---|---|---|---|---|---|
| SHADE | Shade Control Mode | shade=N<CR> | 0:OFF<br>1:ON<br>2:Data out<br>3:Data in<br>4:Data all in<br>5:Auto shade for gain<br>6:Auto shade for offset | OK | Shade control mode<br>Getting/setting |
| | | shade[?]<CR> | Non | 0:OFF<br>1:ON<br>2:Data out<br>3:Data in<br>4:Data all in<br>5:Auto shade for gain<br>6:Auto shade for offset | |
| | shade=2 output data bit | shd_ul=N<CR> | N=0 or 1 | OK | Setting shade=2 output data bit<br>0:FFC coefficients upper 8bit<br>1:FFC coefficients lower 4bit |
| | Gain/Offset | shd_go=N<CR> | 0:OFF<br>1:Gain<br>2:Offset | OK | Target value<br>Getting/setting |
| | | shd_go[?]<CR> | Non | 0:OFF<br>1:Gain<br>2:Offset | |
| | Pixel Address (Lower) | shd_ad0=N<CR> | N:0-255 | OK | Correction targeted pixel<br>(The lower address)<br>Getting/setting |
| | | shd_ad0[?]<CR> | Non | 0-255 | |
| | Pixel Address (Upper) | shd_ad1=N<CR> | N:0-255 | OK | Correction targeted pixel<br>(The upper address)<br>Getting/setting<br>(Note.1) |
| | | shd_ad1[?]<CR> | Non | 0-255 | |
| | Value set (Lower) | shd_dat0=N<CR> | N:0-255 | OK | Data value setting(The lower data) |
| | | shd_dat0[?]<CR> | Non | 0-255 | Getting/setting |
| | Value set (Upper) | shd_dat1=N<CR> | N:0-255 | OK | Data value setting(The upper data) |
| | | shd_dat1[?]<CR> | Non | 0-255 | Getting/setting '(Note.2) |
| | Taget Level for black level | shd_to=N<CR> | N:0-255 | OK | Correction targeted level |
| | | shd_to[?]<CR> | Non | 0-255 | Getting/setting for black level. |
| | Taget Level for gray level | shd_tg=N<CR> | N:0-255 | OK | Correction targeted level |
| | | shd_tg[?]<CR> | Non | 0-255 | Getting/setting for gray level. |
| | Data set | shd_set<CR> | Non | OK | Data set |
| | EEPROM load | shd_epld<CR> | Non | OK | EEPROM all load |
| | EEPROM save | shd_epsv<CR> | Non | OK | EEPROM all save |
| | EEPROM clear | shd_epcl<CR> | Non | OK | EEPROM all clear |
| White balance | Taget Level for level | pwb_tg=N<CR> | N:0-255 | OK | Correction targeted level |
| | | pwb_tg[?]<CR> | Non | 0-255 | |
| | pwb_execute | pwb_set<CR> | Non | OK | White balance |
| OUT PUT MODE | Base Configration Mode | scan_dir=2<CR> | N:0or2 | OK | 80Mhz data rate mode. |
| | | speed=1<CR> | N:0or1 | OK | (Base Configration) |
| | Medium Configration Mode | scan_dir=0<CR> | N:0or2 | OK | 120Mhz data rate mode. |
| | | speed=0<CR> | N:0or1 | OK | (Medium Configration) |

(Note.1) Pixel address = B × 256 + A　:shd_ad0=A shd_ad1=B
(Note.2) Pixel data = D × 256 + C　:shd_dat0=A shd_dat1=D
shd_dat0=0 shd_dat1=0 right edge.

| | Command Name | Format | Argument | Return value | Explanation |
|---|---|---|---|---|---|
| White balance | Taget Level for pwb | pwb_tg=N<CR> | N:0-255 | OK | Correction targeted level |
| | | pwb_tg[?]<CR> | Non | 0-255 | |
| | Mask channel for pwb | pwb_mask_a=N<CR> | N:0-255 | OK | The channel not corrected is set.<br>_a lower 4bit : Red<br>_a upper 4bit : Green<br>_b lower 4bit : Blue |
| | | pwb_mask_b=N<CR> | N:0-255 | OK | |
| | | pwb_mask_a[?]<CR> | Non | 0-255 | |
| | | pwb_mask_b[?]<CR> | Non | 0-255 | |
| | pwb_execute | pwb_set<CR> | Non | OK | White balance |
| LVAL Control | LVAL control on/off | lval=N<CR> | 0:OFF<br>1:ON | OK | LVAL control on/off<br>value reference/setting |
| | | lval[?]<CR> | Non | 0:OFF<br>1:ON | |
| | LVAL start timing | lv_st=N<CR> | 0-255 | OK | LVAL start timing<br>value reference/setting |
| | | lv_st[?]<CR> | Non | 0-255 | |
| | LVAL end timing | lv_end=N<CR> | 0-255 | OK | LVAL end timing<br>value reference/setting |
| | | lv_end[?]<CR> | Non | 0-255 | |
| OUT PUT MODE | Base Configration Mode | scan_dir=2<CR> | N:0or2 | OK | 80Mhz data rate mode.<br>(Base Configration) |
| | | speed=1<CR> | N:0or1 | OK | |
| | Medium Configration Mode | scan_dir=0<CR> | N:0or2 | OK | 120Mhz data rate mode.<br>(Medium Configration) |
| | | speed=0<CR> | N:0or1 | OK | |

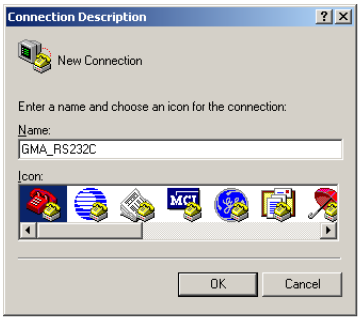
## 11. Setup Steps of Hyper Terminal

[Setup of Hyper terminal ] (In case of Microsoft Windows2000,WindowsXP)

1) Select "Start"→ "Programs"→"Accessories"→"Communications"→"Hyper Terminal"

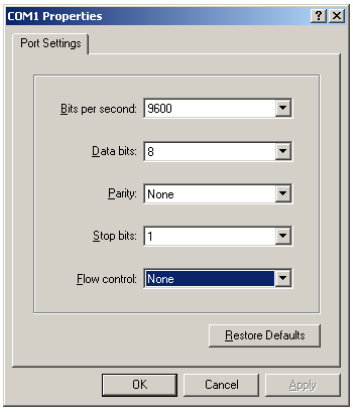
2) The windows will appear with the picture below.


3) When the next picture appears, enter any name.(e.g. GMA_RS232C)
Then click the "OK" button.




4) When the next picture appears, select " COM? " on Connect using.
(COM? changes depending on PC or capture board. )
Then click the "OK" button.

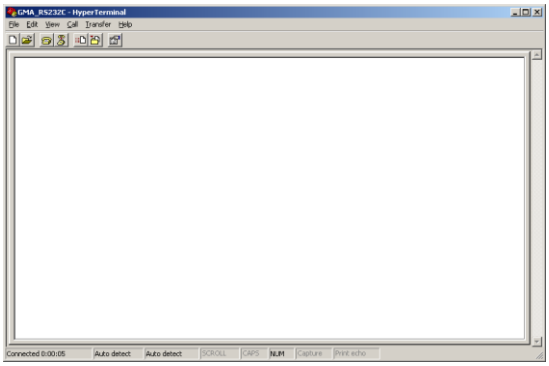

5) When the next picture appears, select each items as follows.(9600,8,None,1,Non)
Then click the "OK" button.



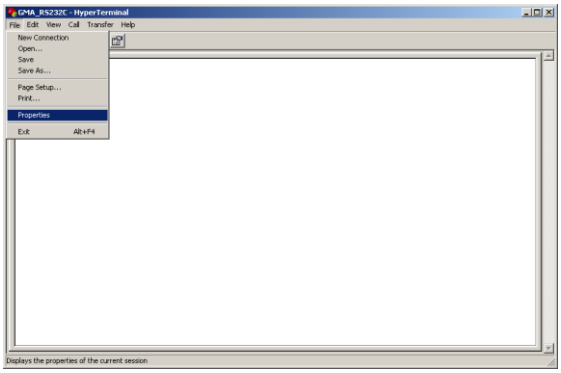

[Network transmission setting]

| | | |
|---|---|---|
| Baud rate | : | 9600 bps |
| Data length | : | 8 bit |
| Start bit | : | 1 bit |
| Stop bit | : | 1 bit |
| Parity | : | Non |
| Xon / Xoff control | : | Non |

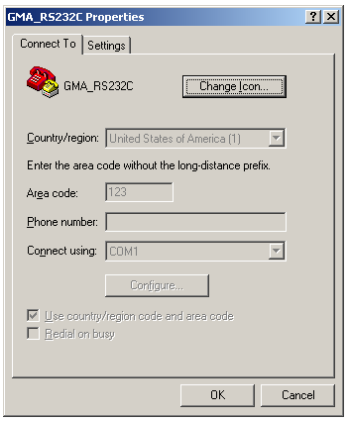
6) The next picture will appear.



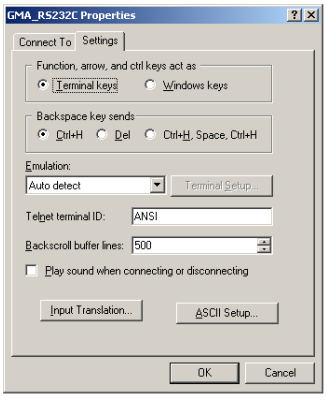

7) Select [File]→ [Properties]



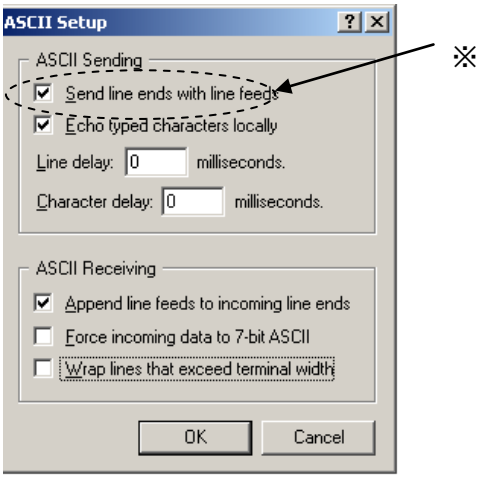

8) Select “Settings” tag.




9) Click the “ASCII Setup” button.

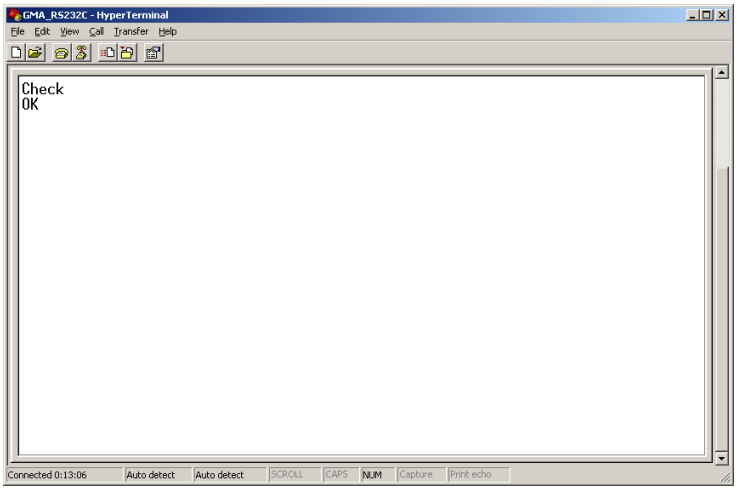


10) When the next picture appears, select each items as follows.(☑, ☑, 0, 0,☑, blank, blank)
Then click the “OK” button.




11) The screen display will return to the screen of paragraph 9.
Then click the OK button.

12) End of setup.
Confirm the connection of the camera, then enter “check” on the screen below and send it out.
If “OK” is displayed on the screen, communication processing has been completed.




※ When using WindowsXP(64bit), it may come to “NG” right after “OK” is displayed. In that case, uncheck the “Send line ends with line feeds” checkbox of above paragraph 10.

13) Select “Start”→ “Programs”→”Accessories”→”Communications”→”Hyper Terminal” →”( * 1) ”, when to launch the Hyper terminal again with the same settings after having exited the above screen.

* 1……The name which was entered at paragraph 3.

## 12. Notes

- If dust sticks to the protective glass of CCD image sensor, image signal cannot be output from the photo diodes on this part and it exhibits symptoms similar to defect pixels.
  In this case, blow away dusts with an air spray. However, note that water droplet may be sprayed out from an air spray.
- Do not store the equipment in extremely hot places where is subjected to direct sunlight.
- Do not remove a cover and do not insert/remove a Camera Link connector when applying current to the equipment. It causes the equipment to malfunction.
- Use a ceramic driver to adjust ODD/EVEN video signal.
- When disposing of the equipment, delegate the task to the industrial waste disposal contractor.
  And execute the disposing procedure following related laws and regulations.
- Do not use the equipment in an environment subject to intense electromagnetic or electrostatic field. Also, if the earth connection is imperfect, the image signal may contains inductive noise components and it causes the equipment to malfunction.

13. External Dimensions