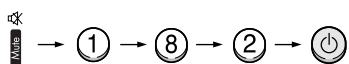


4. Alignment and Adjustments

4-1 When entering the service mode:

1. Turn on the TV, and then select "STANDARD" on the picture adjustment mode.
2. Turn off the TV (STAND-BY).
3. Enter the service mode by pressing the remote control keys in the following sequence :



Note : If necessary, re-do steps 1~3.

Initial display when the service mode is switched.

1. When a RF signal is received

| |
|----------------------|
| SERVICE / Sim-474A |
| DEFLECTION |
| 480P OFFSET |
| 1080i OFFSET |
| CONVERGENCE OFFSET |
| VIDEO ADJUST 1 |
| VIDEO ADJUST 2 |
| VIDEO ADJUST 3 |
| VIDEO ADJUST 4 |
| OPTION (E3h 98h 0ch) |
| RESET / 02-05-03 |

3. Service Mode Control Keys

| | |
|-------------|--|
| MAIN MENU | MENU DISPLAY |
| CH UP/DOWN | Select item by moving cursor |
| VOL UP/DOWN | Decrease or increase the adjustment values |

< PRECAUTIONS >

1. When EEPROM IC (IC902) is replaced, first connect the power cord and wait for about 4~5 seconds.
2. After replacing EEPROM IC (IC902), enter the Service mode. Next, enter the standard data or the previous EEPROM IC data before replacement. And then check and adjust any items related to Geometric, Picture, Option.

4-2 Factory Data

 DVI connection item is corresponded to DVI application model.

4-2-1 Defection

| ITEM | INITIAL DATA | Range | EEP-ROM Copy Data | | | Remark |
|-----------------|--------------|--------|-------------------|------|-------|----------|
| | | | RF | 480P | 1080i | |
| V Amp | | 0 ~ 63 | 31 | - | - | variable |
| V Shift | 32 | 0 ~ 63 | 29 | - | - | fix |
| H EW | | 0 ~ 63 | 31 | - | - | variable |
| H Shift | 32 | 0 ~ 63 | 31 | - | - | fix |
| V Linearity | 6 | 0 ~ 15 | 7 | - | - | fix |
| Upper Linearity | 7 | 0 ~ 15 | 0 | - | - | fix |
| Lower Linearity | 8 | 0 ~ 15 | 0 | - | - | fix |
| VSC | 3 | 0 ~ 15 | 7 | - | - | fix |
| H Parabola | 10 | 0 ~ 63 | 31 | - | - | fix |
| Upper Corner | 32 | 0 ~ 63 | 31 | - | - | fix |
| Lower Corner | 32 | 0 ~ 63 | 31 | - | - | fix |
| H Trapezium | 32 | 0 ~ 63 | 31 | - | - | fix |
| Bow | 32 | 0 ~ 63 | 31 | - | - | fix |
| Angel | 32 | 0 ~ 63 | 31 | - | - | fix |
| V Position | 32 | 0 ~ 63 | 31 | - | - | fix |
| CXA Left Blk | 35 | 0 ~ 63 | 35 | - | - | fix |
| CXA Right Blk | 35 | 0 ~ 63 | 35 | - | - | fix |

4-2-2 480P Offset

| ITEM | INITIAL DATA | Range | EEP-ROM Copy Data | | | Remark |
|-----------------|--------------|----------|-------------------|------|-------|----------|
| | | | RF | 480P | 1080i | |
| V Amp | 0 | -63 ~ 63 | - | 0 | - | variable |
| V Shift | 0 | -63 ~ 63 | - | 0 | - | variable |
| H EW | 0 | -63 ~ 63 | - | 0 | - | variable |
| H Shift | 0 | -63 ~ 63 | - | 0 | - | variable |
| V Linearity | 0 | -15~ 15 | - | 0 | - | fix |
| Upper Linearity | 0 | -15~ 15 | - | 0 | - | fix |
| Lower Linearity | 0 | -15~ 15 | - | 0 | - | fix |
| VSC | 0 | -15~ 15 | - | 0 | - | fix |
| H Parabola | 0 | -63 ~ 63 | - | 0 | - | fix |
| Upper Corner | 0 | -63 ~ 63 | - | 0 | - | fix |
| Lower Corner | 0 | -63 ~ 63 | - | 0 | - | fix |
| H Trapezium | 0 | -63 ~ 63 | - | 0 | - | fix |
| Bow | 0 | -63 ~ 63 | - | 0 | - | fix |
| Angel | 0 | -63 ~ 63 | - | 0 | - | fix |
| V Position | 0 | -63 ~ 63 | - | 0 | - | fix |
| CXA Left Blk | | -63 ~ 63 | - | 28 | - | fix |
| CXA Right Blk | | -63 ~ 63 | - | 36 | - | fix |

4-2-3 1080i Offset

| ITEM | INITIAL DATA | Range | EEP-ROM Copy Data | | | Remark |
|-----------------|--------------|----------|-------------------|------|-------|----------|
| | | | RF | 480P | 1080i | |
| V Amp | 0 | -63 ~ 63 | - | - | 0 | variable |
| V Shift | 0 | -63 ~ 63 | - | - | 0 | variable |
| H EW | 0 | -63 ~ 63 | - | - | 0 | variable |
| H Shift | 0 | -63 ~ 63 | - | - | 0 | fix |
| V Linearity | 0 | -15~ 15 | - | - | 0 | |
| Upper Linearity | 0 | -15~ 15 | - | - | 0 | |
| Lower Linearity | 0 | -15~ 15 | - | - | 0 | |
| VSC | 0 | -15~ 15 | - | - | 0 | |
| H Parabola | 0 | -63 ~ 63 | - | - | 0 | |
| Upper Corner | 0 | -63 ~ 63 | - | - | 0 | |
| Lower Corner | 0 | -63 ~ 63 | - | - | 0 | |
| H Trapezium | 0 | -63 ~ 63 | - | - | 0 | |
| Bow | 0 | -63 ~ 63 | - | - | 0 | |
| Angel | 0 | -63 ~ 63 | - | - | 0 | |
| V Position | 0 | -63 ~ 63 | - | - | 0 | |
| CXA Left Blk | | -63 ~ 63 | - | - | 63 | |
| CXA Right Blk | | -63 ~ 63 | - | - | 20 | |

4-2-4 CONVERGRNCE OFFSET

| ITEM | INITIAL DATA | Range | EEP-ROM Copy Data | | | Remark |
|---------------|--------------|----------|-------------------|------|-------|----------|
| | | | RF | 480P | 1080i | |
| Offset Enable | 0 | 0 ~ 1 | 0 | | | variable |
| V Amp | 15 | -63 ~ 63 | 15 | | | variable |
| V Shift | 0 | -63 ~ 63 | 0 | | | variable |
| H EW | 15 | -63 ~ 63 | 15 | | | variable |
| V Amp 1080i | 15 | -63 ~ 63 | 15 | | | variable |
| V Shift 1080i | 0 | -63 ~ 63 | 0 | | | variable |
| H EW 1080i | 15 | -63 ~ 63 | 15 | | | variable |

4-2-5 VIDEO ADJUST 1

| ITEM | INITIAL DATA | Range | EEP-ROM Copy Data | | | Remark |
|--------------|--------------|--------|-----------------------------|----------------------|-------|----------|
| | | | RF-Copy | W/B Control Value | 1080i | |
| R Cutoff | 20 | 0 ~ 63 | 31 | 20 | 31 | variable |
| G Cutoff | 20 | 0 ~ 63 | 31 | 20 | 31 | variable |
| B Cutoff | 20 | 0 ~ 63 | 31 | 20 | 31 | fix |
| Color On/Off | 1 | 0 ~ 1 | | 1 | | |
| CR offset | 32 | 0 ~ 15 | 32 | | | fix |
| CB offset | 32 | 0 ~ 15 | 32 | | | fix |
| R Driver | 31 | 0 ~ 15 | 20 | 31 | 20 | variable |
| G Driver | 31 | 0 ~ 15 | 20 | 31 | 20 | fix |
| B Driver | 31 | 0 ~ 63 | 20 | 31 | 20 | variable |
| Sub Bright | 15 | 0 ~ 63 | | 15 | | variable |
| Sub Contrast | 7 | 0 ~ 15 | | 7 | | variable |
| Sub Color | 20 | 0 ~ 23 | | 20 | | |
| SubTint | 7 | 0 ~ 13 | 8(AV/SV/DVD/480P) | | 10 | fix |
| CTI Level | 1 | 0 ~ 3 | 1 (RF/AV/SV/DVD/480P/1080i) | | | fix |
| CDL AXIS | 2 | 0 ~ 3 | 2 | | | fix |
| LTI Level | 0 | 0 ~ 3 | 1(RF/AV/SV/DVD/480P) | | 2 | fix |

4-2-6 VIDEO ADJUST 2

| ITEM | INITIAL DATA | Range | EEP-ROM Copy Data | | | Remark |
|---------------|--------------|--------|-----------------------------|---------------------|----------|--------|
| | | | RF | 480P | 1080i | |
| ABL Mode | 3 | 0 ~ 3 | 3 | | | fix |
| Gamma | 2 | 0 ~ 3 | 1 | | | fix |
| DPIC Level | 3 | 0 ~ 3 | 3 | | | fix |
| DC Trans | 3 | 0 ~ 3 | 1 | | | fix |
| ABL TH | 15 | 0 ~ 15 | 15 | | | fix |
| VM Level | 2 | 0 ~ 3 | 2 | | | fix |
| VM Coring | 0 | 0 ~ 3 | 0 | | | |
| VM f0 | 0 | 0 ~ 3 | 2 (RF/AV/SV/DVD/480P) | | 1 | fix |
| VM Limit | 0 | 0 ~ 3 | 0 | | | |
| VM Delay | 0 | 0 ~ 3 | 0 (RF/AV/DVD) | | 1 (480P) | fix |
| SHP CD | 1 | 0 ~ 3 | 1 | | | |
| SHP f0 | 0 | 0 ~ 1 | 0 | 1 (AV/SV/DVD/Comp2) | | fix |
| SHP f1 & P/O | 11 | 0 ~ 15 | 13 1 (RF/AV/SVHS/DVD/Comp2) | | | fix |
| AKB Time | 13 | 0 ~ 31 | 16 | | | |
| Y/C Delay | 30 | 0 ~ 31 | 30 | | | |
| PIP Y/C Delay | 30 | 0 ~ 31 | 30 | | | |
| BAND PASS F | 1 | 0 ~ 7 | 1 | | | |
| HIGH PASS F | 3 | 0 ~ 7 | 3 | | | |

4-2-7 VIDEO ADJUST 3

| ITEM | INITIAL DATA | Range | EEP-ROM Copy Data | | | Remark |
|----------------|--------------|--------|-------------------|------|-------|--------|
| | | | RF | 480P | 1080i | |
| VSU | 2 | 0 ~ 15 | 2 | - | - | |
| Melody Volume | 4 | 0 ~ 20 | 4 | - | - | |
| H Comp | 0 | 0 ~ 15 | 0 | - | - | |
| V Comp | 0 | 0 ~ 15 | 0 | - | - | |
| Pin Comp | 0 | 0 ~ 15 | 0 | - | - | |
| AFC Comp | 0 | 0 ~ 7 | 0 | - | - | |
| Sync Comp | 0 | 0 ~ 1 | 0 | - | - | |
| NR Off Value | 5 | 0 ~ 9 | 5 | - | - | |
| V-Mute(x100ns) | 8 | 0 ~ 10 | 8 | - | - | |

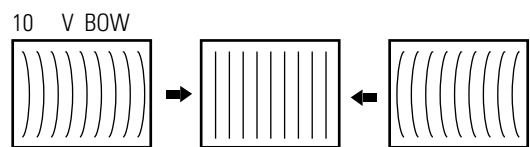
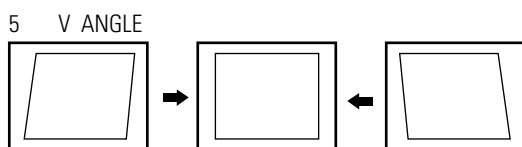
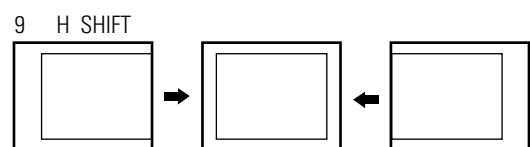
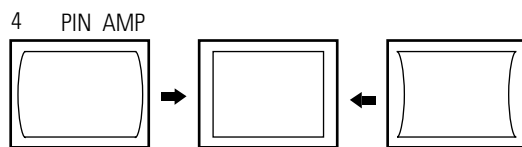
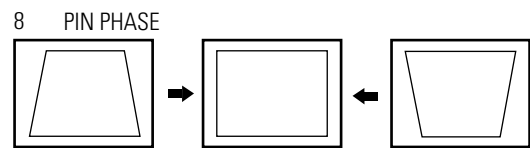
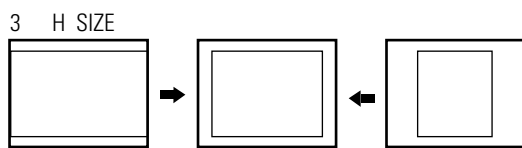
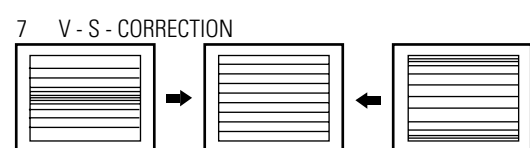
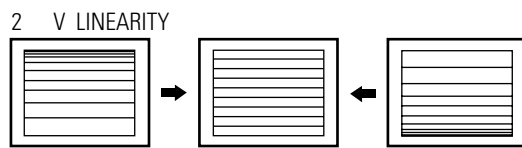
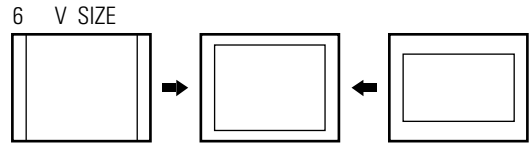
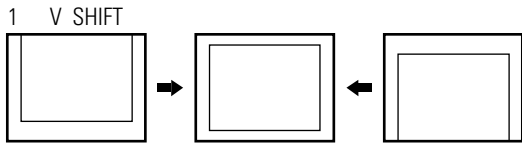
4-2-8 VIDEO ADJUST 4

| ITEM | INITIAL DATA | Range | EEP-ROM Copy Data | | | Remark |
|-------------------|--------------|--------|-------------------|----------------|-------|--------|
| | | | RF | 480P | 1080i | |
| System RF | 1 | 0 ~ 3 | 1 | | | |
| System_VSD_480P | 1 | 0 ~ 3 | | 1 | | |
| System_1080i | 2 | 0 ~ 3 | | | 2 | fix |
| Shp_Fo_VSD_480P | 1 | 0 ~ 1 | | 1 | | |
| HPF_VSD | 3 | 0 ~ 7 | 3 | 3 (AVS/SV/DVD) | | |
| BPF_VSD | 1 | 0 ~ 7 | 1 | 1 (AVS/SV/DVD) | | fix |
| Chrm_bdwth_RF | 28 | 0 ~ 63 | 28 | | | fix |
| Chrm_bdwth_Video | 28 | 0 ~ 63 | 28 | | | fix |
| Chrm_bdwth_Svideo | 30 | 0 ~ 63 | 30 | | | fix |
| Chrm_bdwth_DVD | 28 | 0 ~ 63 | 28 | | | fix |
| IF_Comp_RF | 2 | 0 ~ 7 | 2 | | | fix |
| IF_Comp_Video | 4 | 0 ~ 7 | 4 | | | fix |
| IF_Comp_Svideo | 5 | 0 ~ 7 | 5 | | | fix |
| IF_Comp_DVD | 4 | 0 ~ 7 | 4 | | | fix |
| VM_Delay_480P | 1 | 0 ~ 3 | | 1 | | fix |

4-2-9 OPTION

| ITEM | INITIAL DATA | Range | HCM4216W,HCM4215W, HCL4715WB,HCM4715W (PCL5415RB,PCM5415R) HCM5525WB,PTH5598W | HCM422W,HCM473WB (PCL545RB,PCM545R) HCM553WB |
|-----------------|--------------|----------------------------|--|--|
| CRT | WIDE | WIDE ↔ 4:3 | WIDE(4:3) | WIDE(4:3) |
| PIP | ON | ON ↔ OFF | ON | ON |
| 3D-Comb Filter | OFF | ON ↔ OFF | OFF | ON |
| Blue Screen | OFF | ON ↔ OFF | ON | ON |
| BBE Effect | ON | ON ↔ OFF | ON | ON |
| Auto power On | ON | ON ↔ OFF | ON | ON |
| System | CT | CT (EN+SP+ER)→CT-A(E+SP+F) | CT | CT |
| Virtual Dolby | OFF | ON ↔ OFF | OFF | OFF |
| ACS | ON | ON ↔ OFF | ON | ON |
| V chip (CT,CTA) | ON | ON ↔ OFF | ON | ON |
| V chop Area | USA | USA | USA | USA |
| Sub Woofer | OFF | ON ↔ OFF | OFF | OFF |
| No Sync Mute | ON | ON ↔ OFF | ON | ON |
| DVI | ON | ON ↔ OFF | OFF | OFF |
| AGC | OFF | ON ↔ OFF | OFF | OFF |
| Tubo Effect | OFF | ON ↔ OFF | OFF | OFF |
| Burst Screen | OFF | ON ↔ OFF | OFF | OFF |
| DW Multi | Large | Large ↔ Double | Large | Double |
| Letter Box | ON | ON ↔ OFF | ON | ON |

4-3 Screen Change (When adjusting I²C Bus Geometric items)



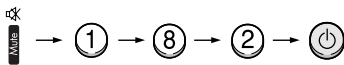
4-4 Other Adjustments

4-4-1 Screen Adjustment

1. Warm up the TV for at least 30 minutes.
2. Select the "STANDARD" Video mode.
3. Turn to the Video Mode (No Signal) using a remote-control.
4. Connect an oscilloscope to RK,GK,BK.
5. Adjust the VR (VR501, VR531, VR561) screen so that RK, GK, BK pulse is 20Vp-p each. (Turn the R,G,B VR screen fully counterclockwise in the area of each flyback line.)

4-4-2 White Balance Adjustment

1. Select the "STANDARD" video mode.
2. Input 100% white pattern.
3. In the stand-by mode, press the remote-control keys in the following sequence:

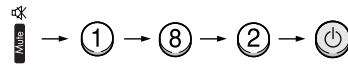


4. Warm up the TV for at least 30 minutes.
5. Input a 10-step signal.
6. R-cut off, B-cut off, and G-cut off by pressing the Volume keys.
7. Adjust the low light with viewing the dark side of the screen.
8. Select R-drive, G-drive, and B-drive by pressing the Volume keys.
9. Adjust the high light with viewing the light side of the screen.
10. If necessary, redo adjustments 6~9.
11. Press the Menu key to exit.

4-4-3 Sub-Brightness Adjustment

1. Input a sub-brightness adjustment signal. (TOSHIBA PATTERN)

2. In the stand-by mode, press the remote-control keys in the following sequence :



3. Select SBT by pressing the Volume keys.
4. Adjust so that the 63 step on the right side of the screen is not seen (Use the Volume keys).
5. Press the Menu key to exit.

4-4-4 High Voltage (29KV) Check

PRECAUTION

1. Input a lion head pattern.
2. Select "STANDARD" video mode.
3. Warm up the TV for at least 10 minutes.
4. Use a 1000:1 probe.

ADJUSTMENT

1. Connect the (+) terminal of the 1000:1 probe to the high voltage distributor and the (-) terminal to GND (located on the deflection board).
2. Adjust RR471S (located on the deflection board) so that the digital meter indicates $DC\ 29V \pm 0.1V$.

4-4-5 F.S. (Fail Safe) Adjustment

Note : The finished product has a well-mounted VR (RR402S).
If necessary, do the F.S. adjustments in the following sequence.

1. Use a digital multimeter.
2. Connect the digital multimeter to the JIG pin (DZ482S) terminals
3. Adjust VR (RR402S) so that the voltage becomes 2.25V.
4. After the adjustments are complete, be sure to mount VR (RR402S) correctly.

4-4-6 F.S. (Fail Safe) Circuit Check

Note : The F.S. Circuit check must be performed after servicing.

1. Turn on the TV.
2. Select the "STANDARD" video mode.
3. Short F/S Test point (located on the SUB PCB). Then, both sound and picture disappear. (Note: Even if the shorted terminals are removed, both sound and picture do not appear. This proves the F.S. circuit is working.)
4. To restore both sound and picture, turn off the TV and reset it after about 30 seconds.

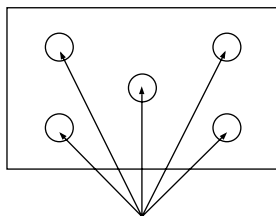
4-4-7 Static Focus Adjustment

PRECAUTION

1. Select the "STANDARD" video mode.
2. Input a crosshatch pattern.
3. Cover the lenses that are not being adjusted.
4. Connect a convergence jig and read data.
5. Adjust the lens for best focus. (See Fig, 4-1)

STATIC FOCUS (CONTINUED)

Vary the focus pack VR (Red, Blue) on the front cabinet. Adjust the TV for best possible focus around the center of the crosshatch pattern, without losing overall screen balance. Figure Crosshatch Pattern Examine these points together.



Examine these points together

Fig. 4-1 Crosshatch Pattern.

4-4-8 Lens Focus Adjustment

PRECAUTIONS

1. Do this adjustment after the static focus adjustment and the tilt adjustment.
2. Select the "STANDARD" video mode. (Contrast:100, Brightness:50)
3. Input a crosshatch pattern.

ADJUSTMENT

1. Loosen the lens screws.
2. Cover the two lenses that are not being adjusted.
3. Adjust the lens, observing the color aberration vertically and horizontally within 3 blocks of the center of the crosshatch pattern.
4. When the lens is turned clockwise, the color aberration will change as follows:

| <u>Lens</u> | <u>Color Aberration Change</u> |
|-------------|--------------------------------|
| R | Orange - Crimson |
| G | Blue - Red |
| B | Purple - Green |

5. Green lens adjustment:
Set the lens at the point where Blue just changes to Red. If the color aberration is irregular throughout the picture screen, adjust the lens to show Red color aberration (approximately 1~3 mm area) within a 3-block grid around the horizontal center-line. If the color aberration is irregular, adjust the lens as shown in the diagram below. (Accurate alignment of Green is important for overall color quality.)
6. Red lens adjustment
Set the Red lens at the point where Orange becomes Crimson.
7. Blue lens adjustment
Set the Blue lens at the point where Purple becomes Green.

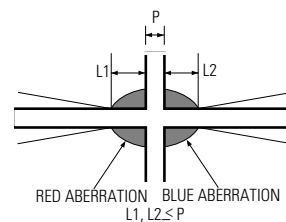
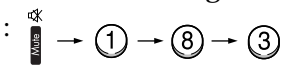
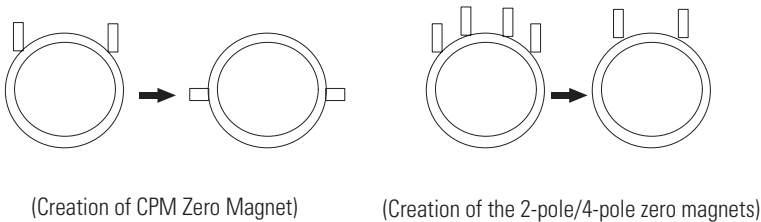





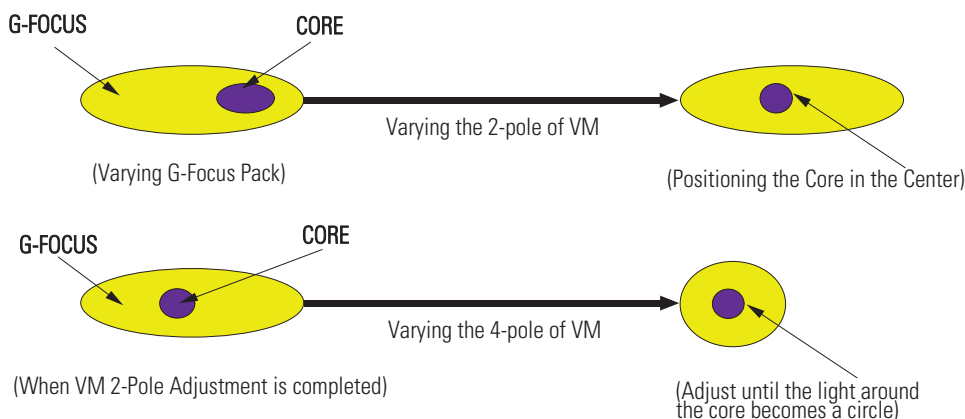
Fig. 4-2 Color Aberration



4-5 Beam alignment Adjustments

1. Select the "STANDARD" video mode.
2. Warm up the set at least for 10 minutes.
3. Enter the Convergence mode by pressing the remote control buttons in the following sequence
 : 
4. Set the Beam Alignment Adjustment CY to Zero magnetic field area.



5. Check the squarewave at the point where the focus is misaligned (Use an audio oscillator).
6. Press the  button on the remote control, and a vibrating dot-pattern appears.
7. Adjust the Focus-pack VR for defocusing.
8. Mute the other patterns (R/B) other than G-PATTERN.
 (Use  /  buttons on the remote control.)
9. Adjust the 2, 4 polarities of VM-COIL as shown in figure below.
10. Adjust the G-Focus until any light around the core disappears.



11. Adjust G-Focus so that the surrounding flash can disappear from the spot.
12. After G-Focus adjustments are complete, adjust R-Focus as above procedures.
13. The B-CRT adjustments can be omitted because the variance of beam focus is small.
 (Only Vm-coil is mounted.)
14. Adjust the Focus-pack VR for fine focusing.
15. Press the  button on the remote control, and the mode changes to the Convergence Adjustment mode.
16. Press the  button on the remote control to return to normal viewing.

4-6 High Voltage Part

4-6-1 PWM REG Circuit

For the existing high voltage REG circuit (input voltage variation type), a dynamic REG response is not provided. So it is difficult for both beam linearity and uniformity in screen size to be maintained on the screen with rapidly changing beams.

A PWM (Pulse Width Modulation) type of high voltage, however, provides the maintenance of beam linearity and uniformity in screen size via a quick response to beam change by performing sync lock every 1H line, and detecting beam fluctuation at 1H line, and then controlling the IC current of high voltage output circuit.

1. High Voltage Fluctuation Detect (DC Detect)

FBT pin 11 detects DC high voltage fluctuation. The detected DC high voltage value is input to PWM IC471 pin1 through R473, VR471, R471, and then it is input to a differential AMP circuit that differentiates the gap after comparing with the reference voltage input to pin2.

2. High Voltage Fluctuation Detect (AC Detect)

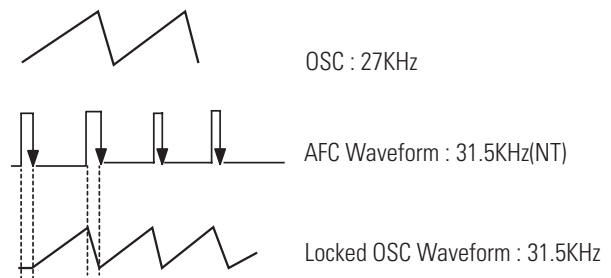
To check AC high voltage fluctuation, the output from FBT is detected by using a capacitor inside the high voltage distributor. The detection of AC high voltage fluctuation, a detection of dynamic beam current change is required in order to keep beam linearity and uniformity in size.

Regarding the capacitor, a capacity of less than 3000P should be applied to a PWM type. (The existing type needs a capacity of about 6000P.) AC detect circuit eliminates unnecessary high frequency by using C476, D472. Also, AC gain is limited to + / - 0.7V (D472). This AC gain is combined with the detection value of DC high voltage fluctuation by using C478.

3. PWM IC OSC Sync Lock

A PWM type IC needs sync lock for PWM pulse and horizontal scan line.

The standard time constant of OSC circuit is determined by C487, R475 (PWM IC pins 5 and 6). And the standard OSC frequency is about 27 kHz. The horizontal frequency of scan line is 31.5kHz(NT), 3375kHz(DTV), 15.75kHz(Interface), so sync lock for this horizontal frequency should be performed using sync lock circuit. The sync lock circuit consists of Q481(Tr KSC815-Y), D479, D478, and C492. The input AFC signal is connected to PWM IC pin 5 through D479 so that it can be negative Trig.

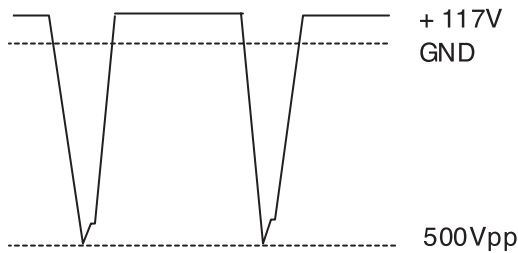


4. Dead Time (HV Protect)

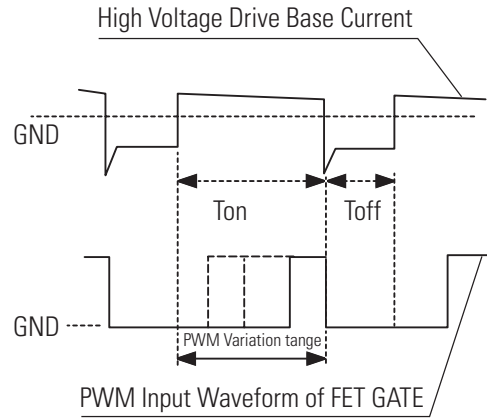
Dead Time (PWM IN pin4) consists of C481, delays high voltage for a certain time to soft start in power on, a x-ray protection circuit. The voltage of Dead Time is detected by FBT pin7 and through DC Feedback. The normal voltage of Dead Time is +27V. When high voltage increases, however, detected voltage is in proportion to high voltage. Then, the detected voltage is applied to ICR01S(TL431). If the voltage is over 2.5V (normal:about 2.25V), TL431 turns ON, the base port of QR401S becomes low, and then an emitter current flows. At this time, a high voltage protection point is set. When QR401S turns ON, high voltage is applied to PWM IC pin4 and then muted.

5. Output Circuit

The voltages, which are detected form an error detection circuit of PWM IC (Differential AMP) and Dead Time, each is applied to PWM comparator . Due to these detection coltages, Q1, Q2 (Output TR) parallel operate. Q482 (External TR), however, functions as a buffer; natches impedance between the output port of PWM IC and the final output TR(IRFS640). The PWM pulse (applied to the final output FET (IRFS640 GATE) varies the IC current of high voltage TR(Q473) by adjusting the load impedance of storage Trans (T431). Due to this variation of current, the gain for Q473 emitter pulse changes T444(FBT)makes this emitter pulse became high voltage. Such change keeps both dynamic and static changes fixed. The output waveform of high voltage TR emitter is as shown in the figure below.



about 1V. A PWM modulation type REG detects static, dynamic high voltage fluctuation for only Ton Time (when the current of the output TR collector flows) each 1H, and modulates the width of PWM pulse. So, this PWM type has better improvement in the characteristic of high voltage REG as compared to the existing type.



8. Application Effects

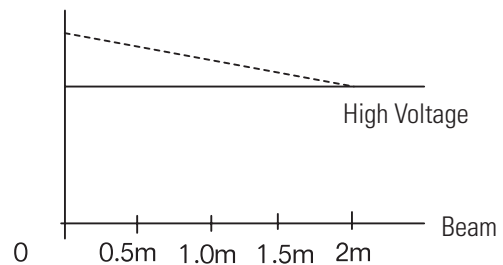
- 1) Improvement of horizontal size fluctuation
- 2) Linearity improved
- 3) Embodiment of X-ray protection circuit

The figures below show characteristics when a PWM high voltage REG circuit is applied.

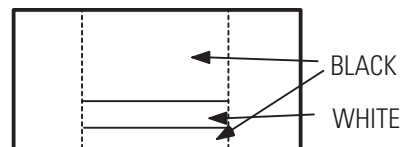
6. Parameters according to beam

To maintain the set high voltage value (31kV), parmaters such as +Ve (DC), Vcp High Voltage change (See the table below).

| Factor of high voltage change | Parameters | | | |
|-------------------------------|-------------------------|-----------|-----|--------------|
| | Width of FET Gate Pulse | + Ve (DC) | Vcp | High Voltage |
| Beam ↓ (High voltage ↑) | ↓ | ↑ | ↓ | ↓ |
| Beam ↓ (High voltage ↑) | ↑ | ↓ | ↑ | ↑ |



----- High Voltage OFF
 _____ High Voltage REG ON



PWM type



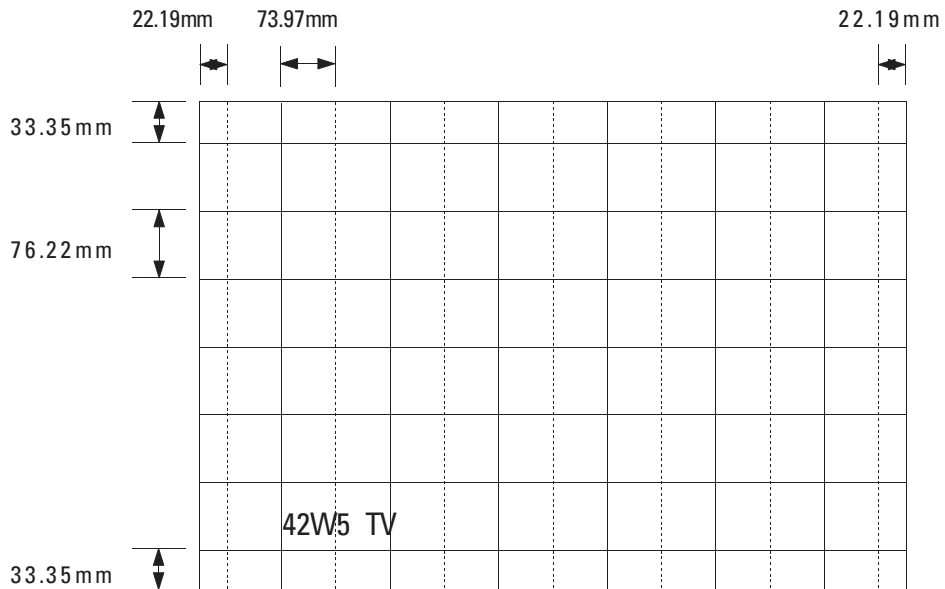
Existing type

When a Toshiba Pattern is received, the screen is displayed as shown in figure side

4-7 Screen-Jig

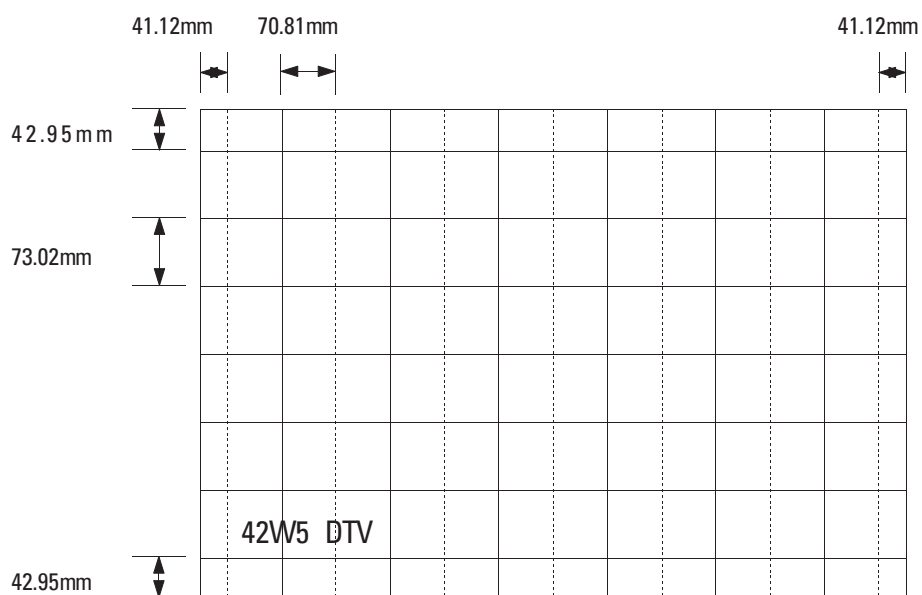
4-7-1 HCM4215W/HCM422W/HCM4216W (NORMAL MODE)

42W5ScreenSize:X932,Y524(X:378=9*2+30*12,Y:440=28*2+64*6)



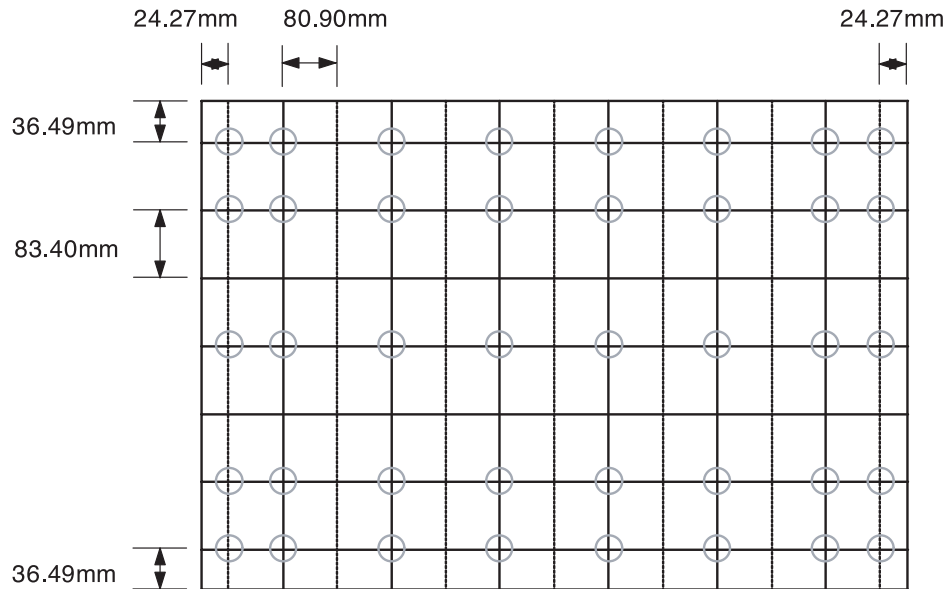
4-7-2 HCM4215W/HCM422W/HCM4216W (DTV MODE)

42W5 DTV Mode : X 932, Y 524 (X:408=18*2+31*12, Y:488=40*2+68*6)



4-7-3 473W/4715W (NORMAL MODE)

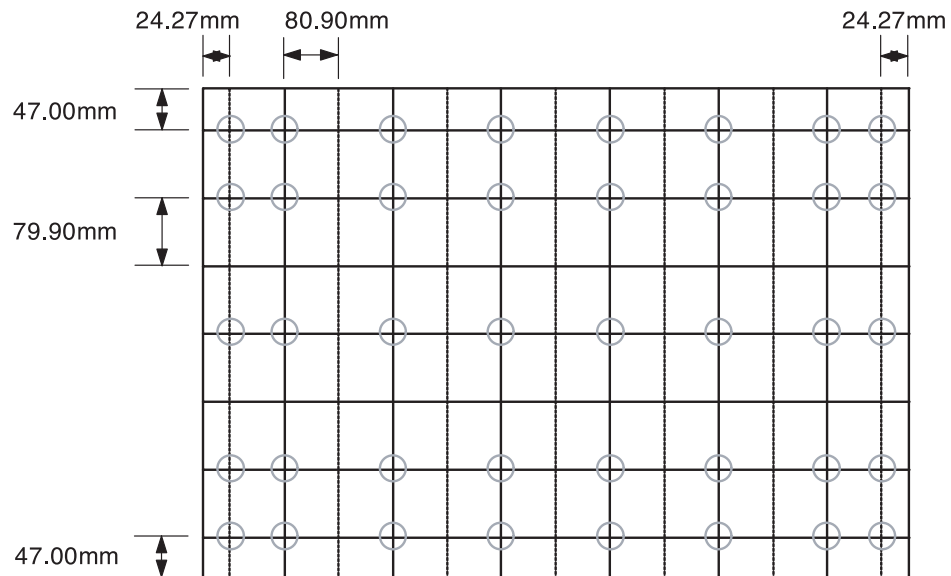
Screen Size : X 1019.4 Y 573.4(X:378=9*2+ 30*12, Y:440=28*2+ 64*6)



Note: "O" Cursor Point

4-7-4 473W/4715W (DTV MODE)

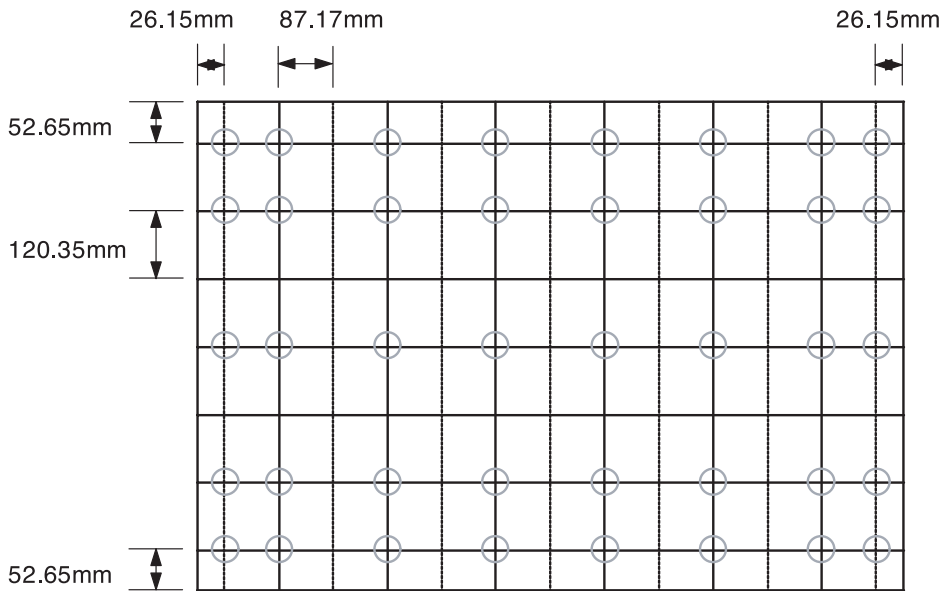
Screen Size : X 1019.4 Y 573.4 (X:378=9*2+ 30*12, Y:488=40*2+ 68*6)



Note: "O" Cursor Point

4-7-5 5415R/545R/54J9 (NORMAL MODE)

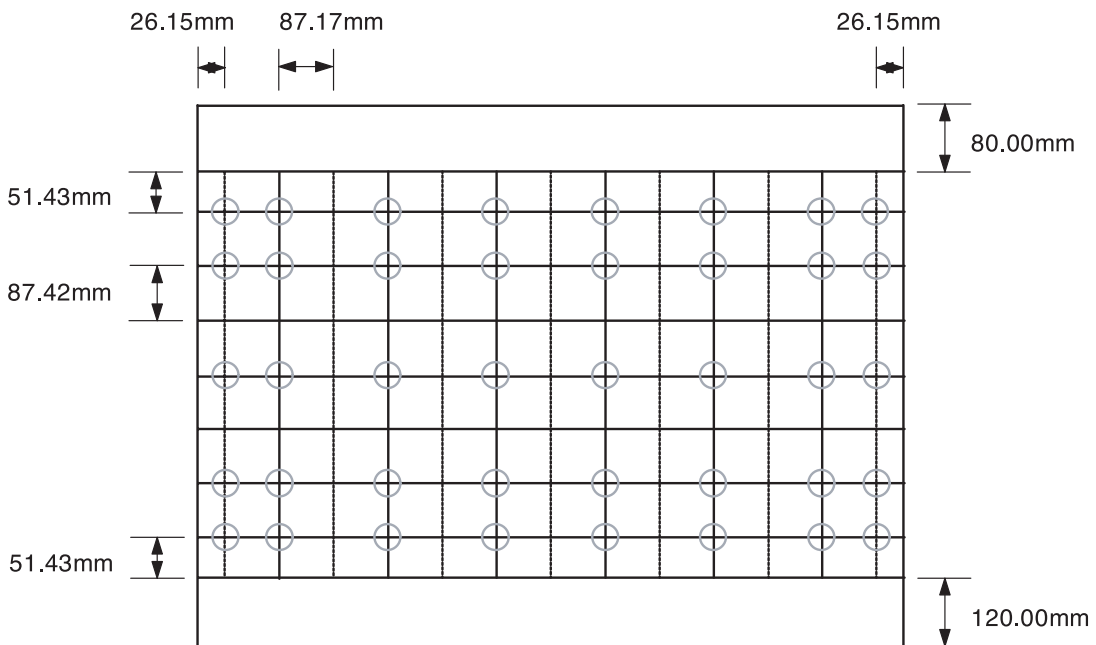
Screen Size : X 1098.4, Y 827.4 (X:378=9*2+ 30*12, Y:440=28*2+ 64*6)



Note: "O" Cursor Point

4-7-6 5415R/545R/54J9 (DTV MODE)

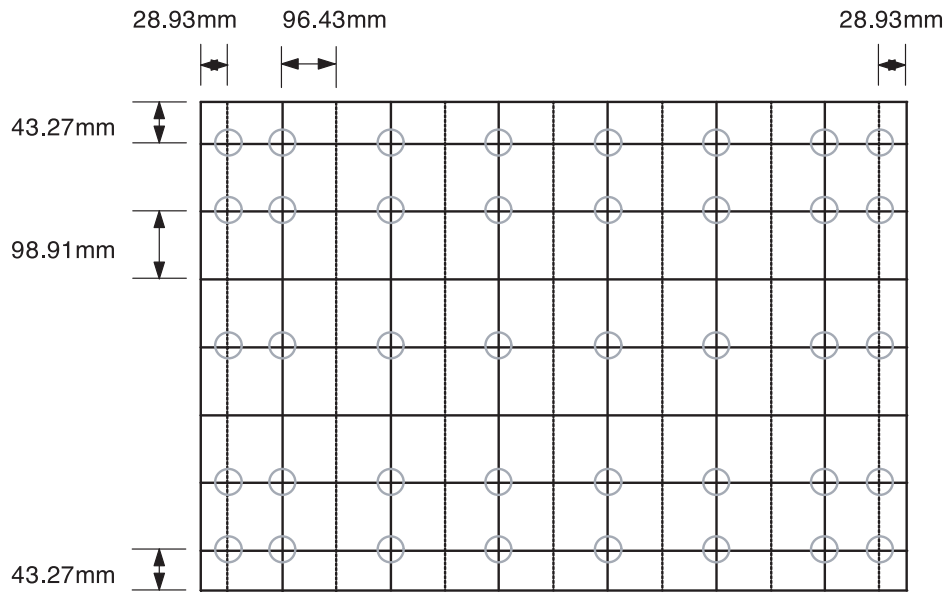
Screen Size : X 1098.4, Y 627.4(X:378=9*2+ 30*12, Y:488=40*2+ 68*6)



Note: "O" Cursor Point

4-7-7 552W/5515W/5525W/553W/PTH5598 (NORMAL MODE)

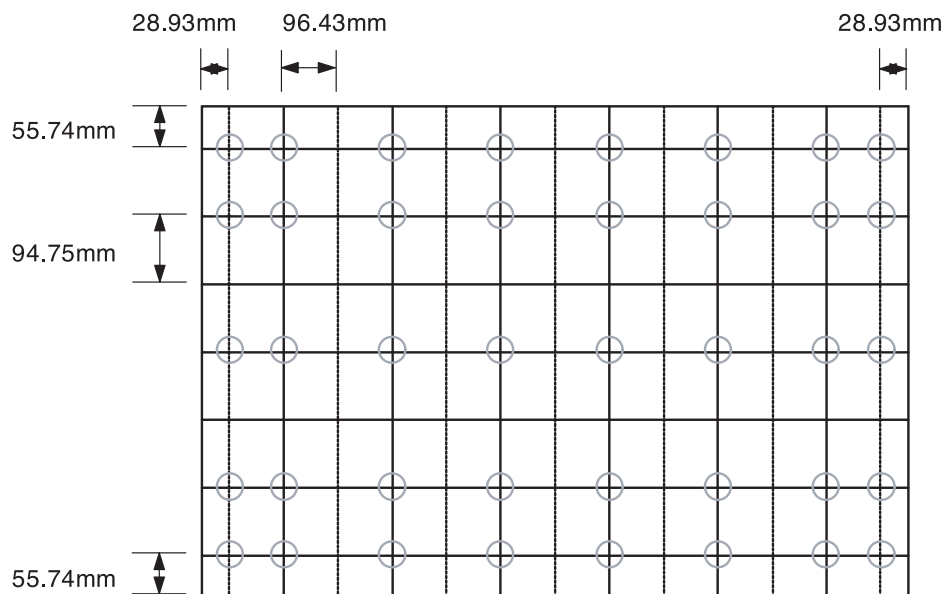
Screen Size : X 1215, Y 680 (X:378=9*2+ 30*12, Y:440=28*2+ 64*6)



Note: "O" Cursor Point

4-7-8 552W/5515W/5525W/553W/PTH5598 (DTV MODE)

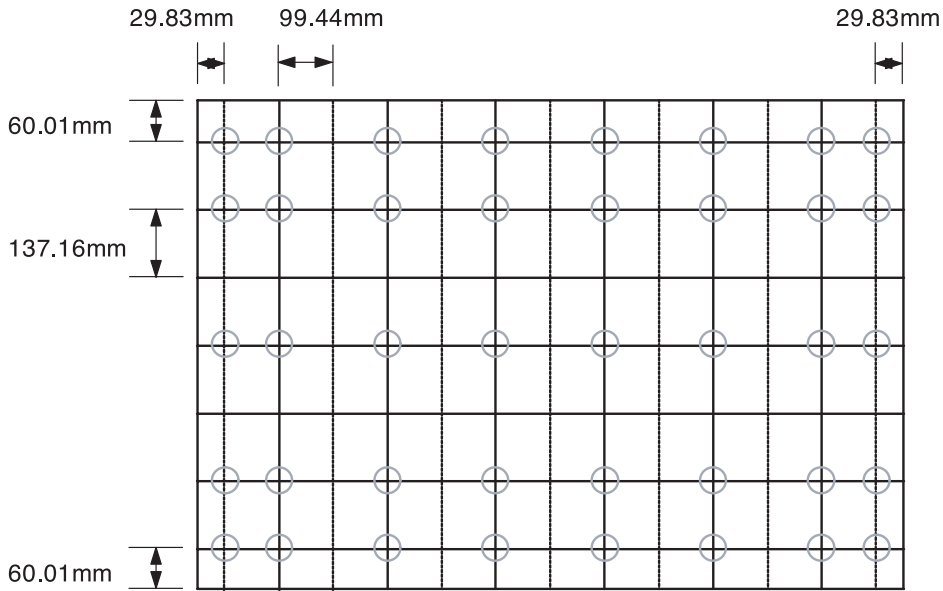
Screen Size : X 1215, Y 680 (X:378=9*2+ 30*12, Y:488=40*2+ 68*6)



Note: "O" Cursor Point

4-7-9 6215R (NORMAL MODE)

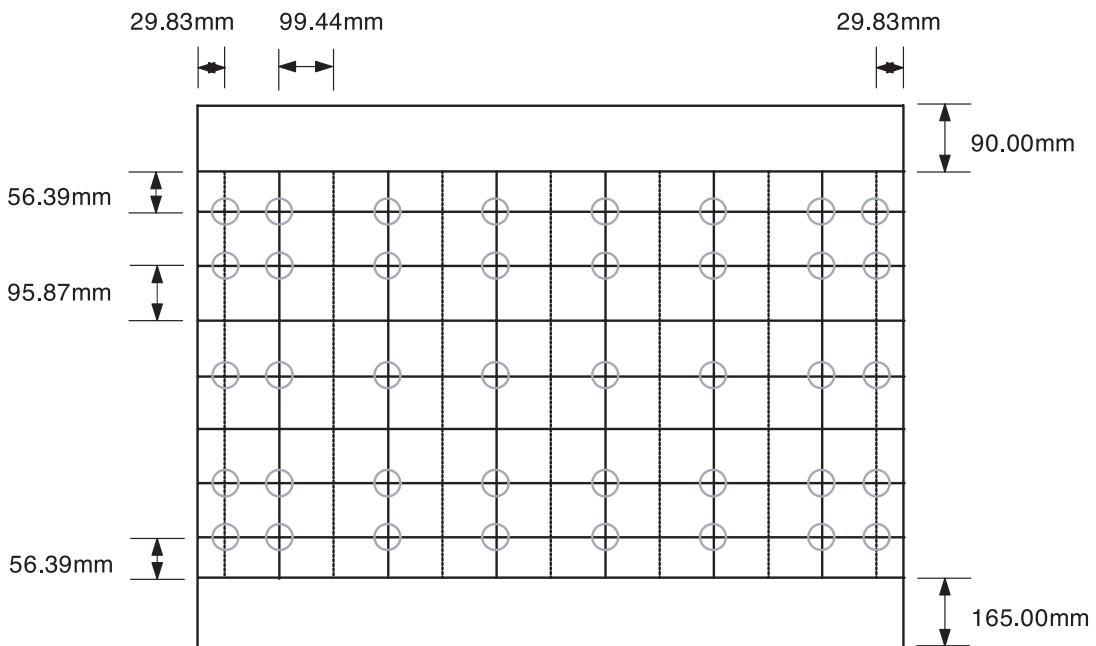
Screen Size : X 1253, Y 943 (X:378=9*2+ 30*12, Y:440=28*2+ 64*6)



Note: "O" Cursor Point

4-7-10 6215R (DTV MODE)

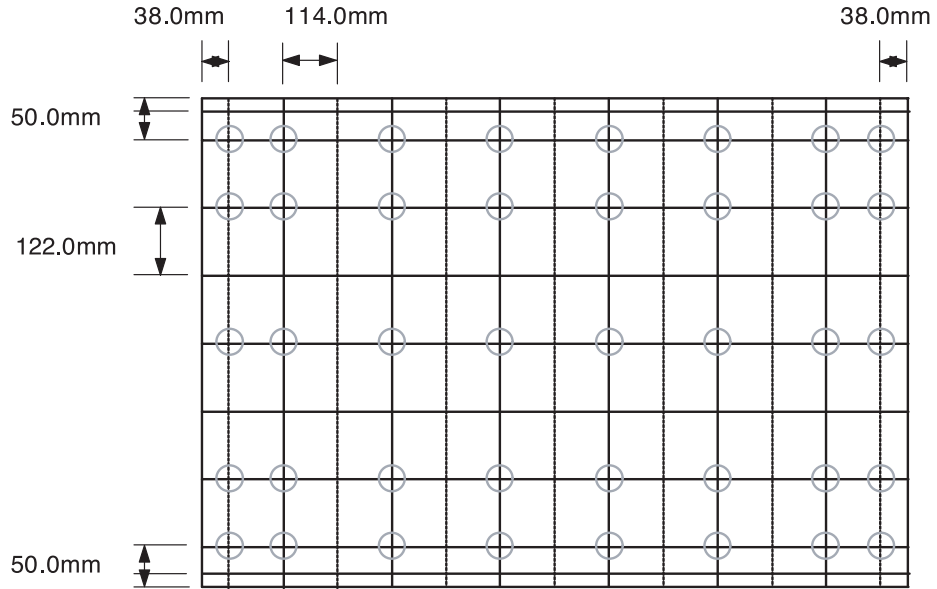
Screen Size : X 1253, Y 688+ 90+ 165(X:378=9*2+ 30*12, Y:488=40*2+ 68*6)



Note: "O" Cursor Point

4-7-11 652W/653W/6515R (NORMAL MODE)

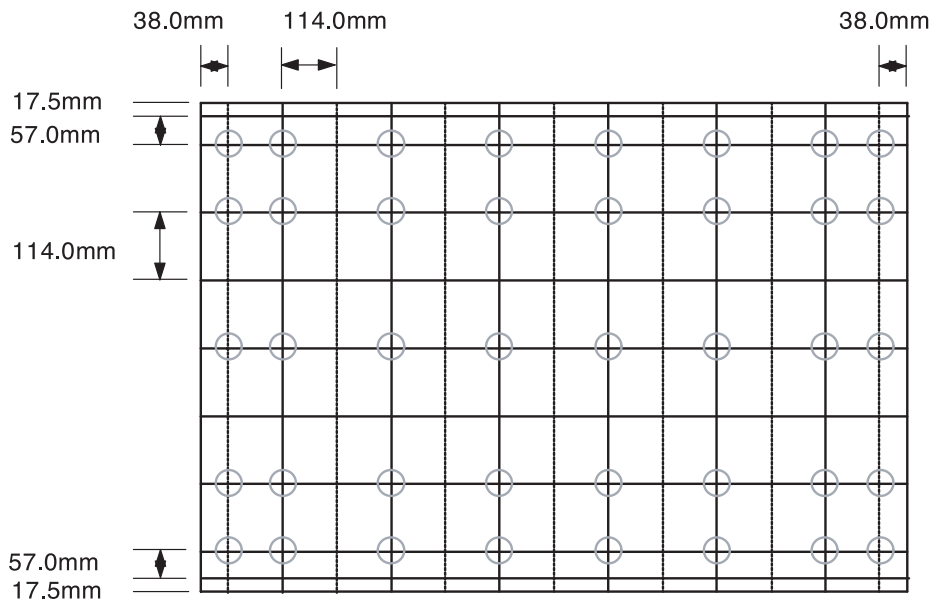
Screen Size : X 1444, Y 832 (X:378=9*2+ 30*12, Y:440=28*2+ 64*6)



Note: "O" Cursor Point

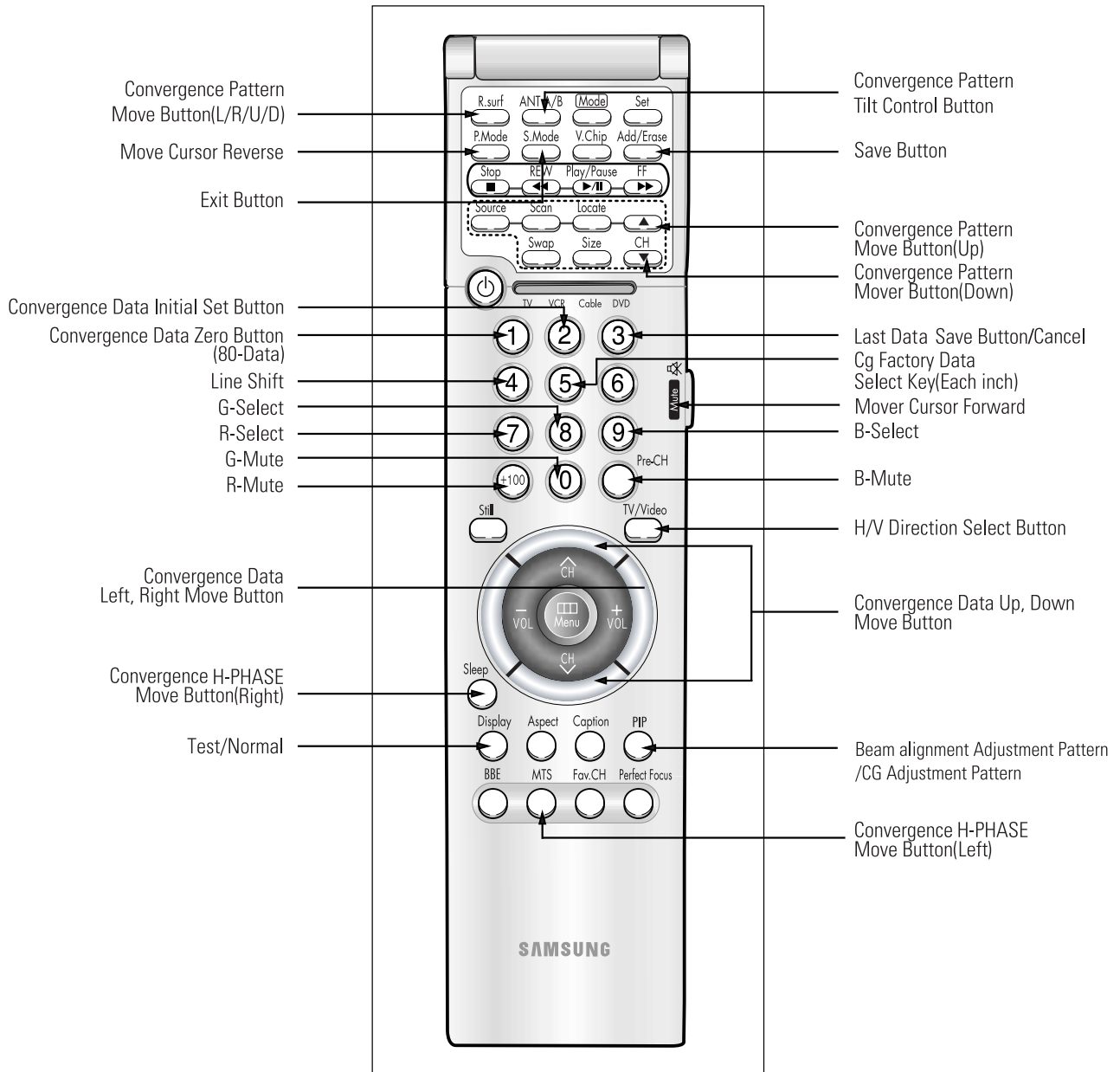
4-7-12 652W/653W/6515R (DTV MODE)

Screen Size : X 1444, Y 832 (X:378=9*2+ 30*12, Y:488=40*2+ 68*6)

















Note: "O" Cursor Point


4-8 Remote Control for Servicing (Convergence Mode)



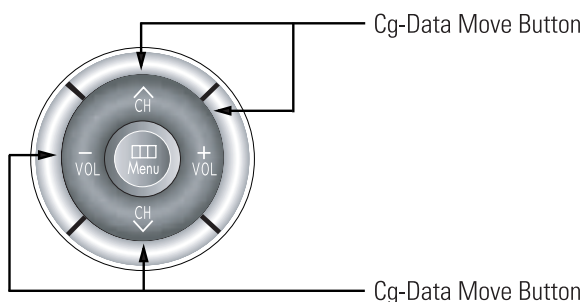
4-7-1 KEY Function

1. R-SELECT 
Press to select RED color.
2. G-SELECT 
Press to select GREEN color.
3. B-SELECT 
Press to select BLUE color.
4. R-MUTE 
Press to mute RED color.
5. G-MUTE 
Press to mute GREEN color.
6. B-MUTE 
Press to mute BLUE color.
7. CANCEL KEY 
Press to revert to the previous data during the Convergence Adjustment.
8. TEST/NORMAL 
Press to check TV mode in the Convergence Mode.
9. LINE SHIFT 
Press to move a line up/down or left/right.
10. FACTORY DATA SELECT BUTTON 
Press to call the factory default values.
11. H/V DIRECTION SELECT BUTTON 
Press to switch the cursor direction horizontally or vertically.
12. SAVE BUTTON 
After the Convergence Adjustments are completed, press to save data.
13. EXIT BUTTON 
After the Convergence adjustments are completed, press to exit to TV mode.

14. **MOVE CURSOR FORWARD** 
 Press to move the cursor right or down.

15. **MOVE CURSOR REVERSE** 
 Press to move the cursor left or up.

16. **CONVERGENCE PICTURE MOVE BUTTON**


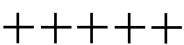
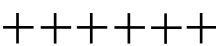




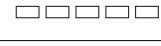


17. **CONVERGENCE MOVE BUTTON**  
 Press to move the convergence left () or right ().

18. **CONVERGENCE DATA ZERO BUTTON** ①
 Press to zero the convergence correction data.

19. **INITIAL DATA SET BUTTON** ②

Changes when applying Almighty-Cg, Module (How to extract the basic Cg Data)

| Inch (Type) | Model Name | Basic Data | Screen Display | Discription |
|----------------------|--------------------------|----------------------------------|--|---|
| | Representative Model | Number after entring the Cg-Mode | | |
| 42" (42W5) | 422W/4215W 42W5/4216W | 5-425 (Press in regular order) |  | |
| 54" (54J9) | PCL545R/ PCL5415R | 5-545 (Press in regular order) |  | White Cross on the background (white cross) |
| 62" (62J9) | PCL6215R | 5-625 (Press in regular order) |  | |
| 55" (552W) | HCL552W/ 5515W | 5-552 (Press in regular order) |  | White Oval on the background (white border) |
| 65" (652W) | HCL652W/ 6515W | 5-652 (Press in regular order) |  | White Oval on the background (white border) |
| 47" (472W) (473W) | HCL472W/ 4715W | 5-473 (Press in regular order) |  | White Square on the backgrand (white border) |
| 65"(653W) | HCM653W | 5-653 (Press in regular order) |  | White Square on the backgrand (white border) |
| 55"(553W) | HCM5525W/ 553W | 5-553 (Press in regular order) |  | White Square on the backgrand (white border) |

20. Move Convergence Pattern P55A Service Manual 

After pressing the R.surf button, use the Channel Up/Down and Volume +/- buttons to move the Convergence Pattern up/down/left/right.

21. Convergence Pattern Tilt Control Button 

After pressing the ANT A/B button, use the Channel Up/Down and Volume +/- buttons to create a tilt to the Convergence Pattern.



Note : Use the following two buttons only when they are indispensable.

21. Beam alignment Adjustment Pattern achieve Button 

4-8 Convergence Adjustment

4-8-1 Convergence Adjustment)



Special Notes

- ⇒ A sensor is attached on the center of each side of the Convergence Mode pattern (see figure below). The sensors are required for normal Perfect Focus function.
- ⇒ Use a screen jig to do the convergence adjustments correctly (Especially, perform correct convergence adjustments on the center of each side where a sensor is located.)
- ⇒ Do the convergence adjustments correctly. Otherwise, any Perfect Focus error can happen.


1. Warm up the TV for a least 30 minutes.
2. Input an NTSC Signal.(Use an antenna or AV source.)

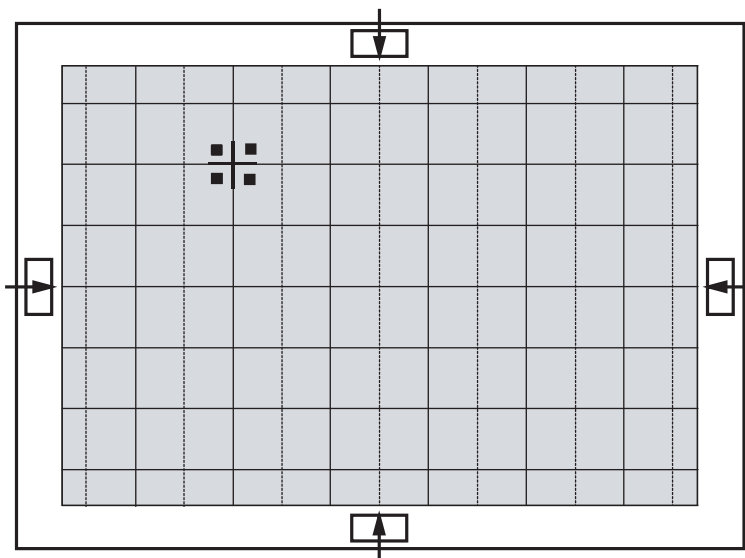





Make sure that deflection yoke are properly adjusted so that the center of Green, Red, Blue pattern is aligned on the center of screen jig.

3. Enter the Convergence Mode by Pressing the remote control keys in the following sequence:




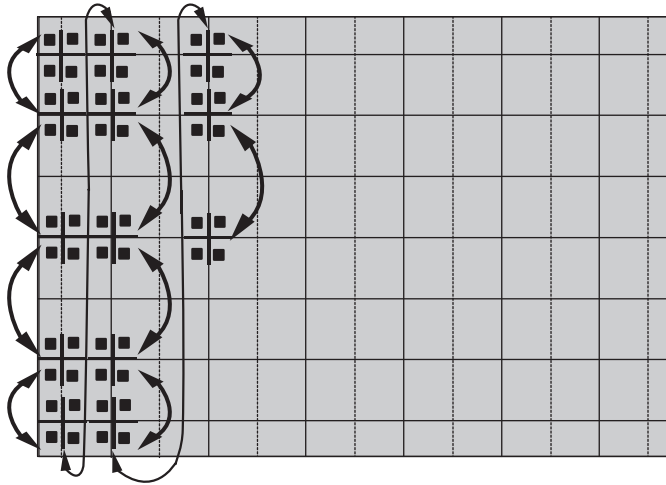
If OSD displayed as shown in figure below, press the  key to exit. Then, redo step 3 to enter the Convergence Mode. After entering the Convergence Mode, Stand by for about five seconds before doing the adjustments.






4. To adjust GREEN, first press the  and the  keys, and then press the  key. Press to move the cursor right or down.

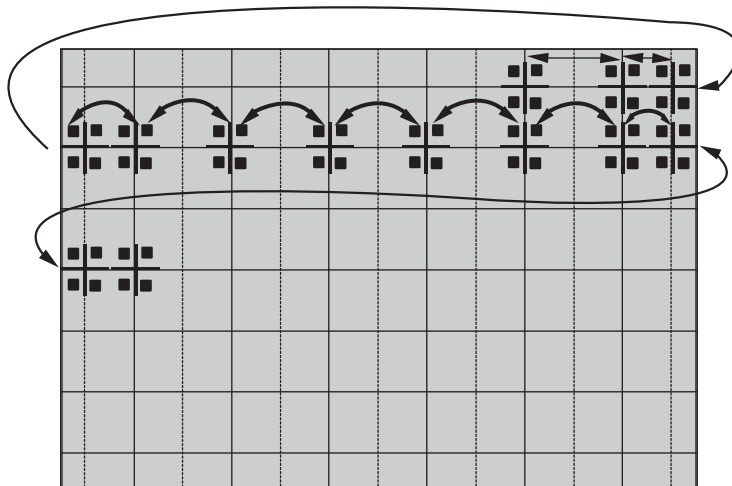


5. The  key moves the cursor horizontally or vertically.

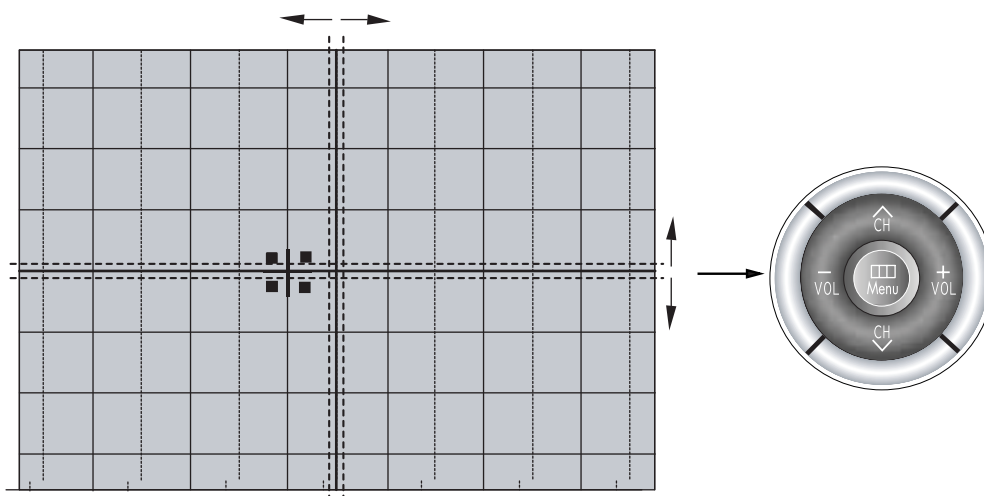


When the  key is pressed once again, the cursor moves horizontally.


6. The  key moves the cursor right, and the  key moves the cursor left.



7. Use the ④ key for overall balance.

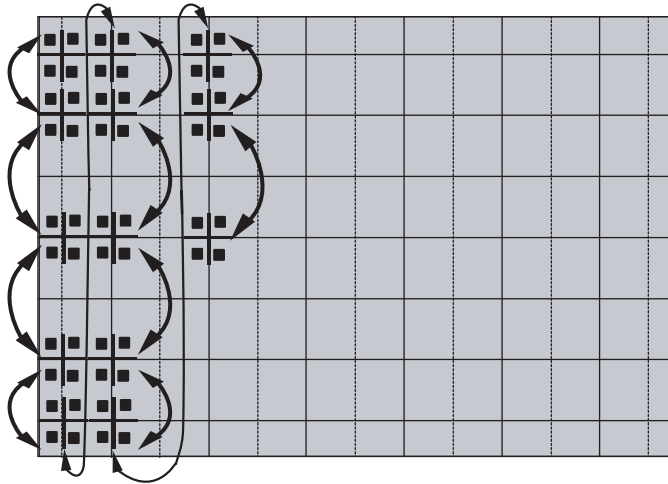


8. After the Line Shift is cancelled by pressing the ④ key, use the Channel and Volume keys (Up/Down) to make big adjustments.




9. After the green convergence adjustments are completed, press the ^{Add/Erase}  key to save the data.

10. Superimpose the Red and Green colors by pressing the  and the  keys.

11. To adjust RED, redo steps 5~7.



When the cursor moves vertically 

12. To superimpose the blue and green colors, press (1) the  key for R-Mute, (2) the  key to cancel the B-Mute, and (3) the  key for B- select

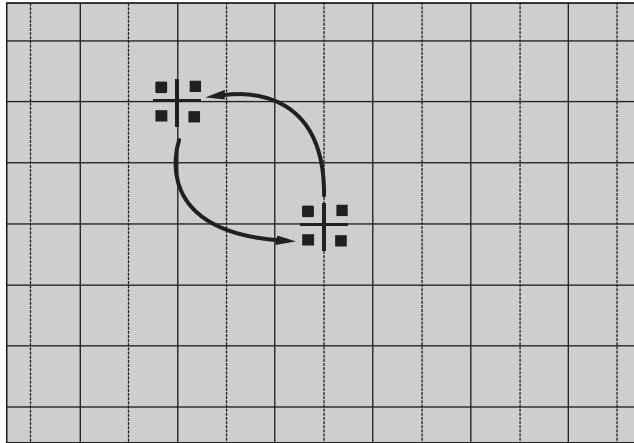
13. To adjust BLUE, redo steps 5~7, 13.

14. If any color is not properly adjusted when displaying the red, blue and green colors, readjust the color.

15. After the color adjustments are completed, press the (Add/Erase) key to save the data.

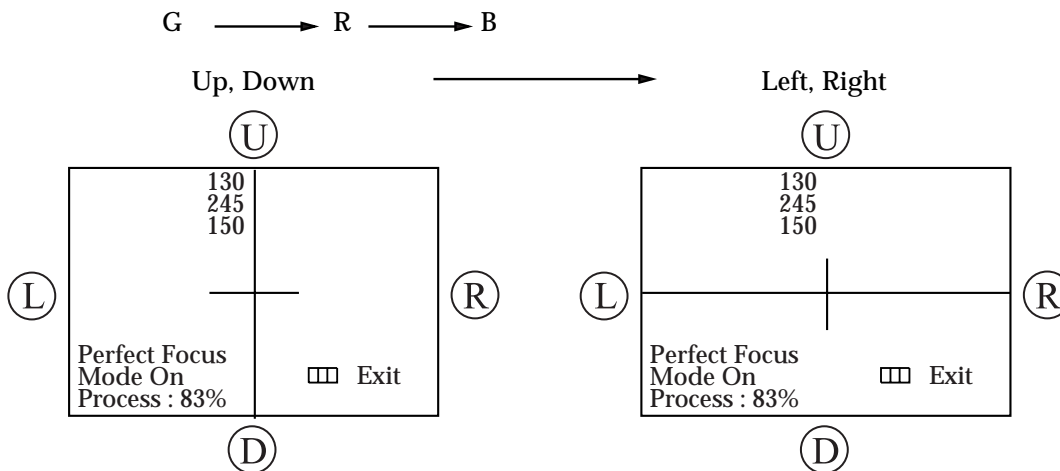


The cursor moves to center, and then automatically moves up and to the left about five seconds later.



4-8-2 Perfect Focus (Factory Mode)


1. After the adjustment is completely saved, press the perfect Focus key to perform Auto Convergence (Factory Mode). Auto Convergence is performed in the following sequences :



When auto Convergence is complete, the data is automatically saved and the convergence pattern revets.



- w After Factory Auto convergence is complete, make sure that the cursor flickers for about 1 second on the center and then it is saved.
- w Check the presence of error through the flicker of the cursor.
- w When any error happens, be sure to re-do Factory Auto Convergence.
- w When Convergence Adjustment is not normally done or the convergence center is misaligned with the sensing point, any adjustment error happens. Therefore, be sure to use a screen jig to correctly adjust during troubleshooting.

2. After the Convergence Adjustments are complete, press the  key to exit.
3. DTV Convergence adjustment must be done same as the above Normal Mode Convergence Adjustment (Use a 16 : 9 screen jig for DTV)



When Convergence Adjustment is not normally done or the convergence center is misaligned with the sensing point, any adjustment error happens. Therefore, be sure to use a screen jig to correctly adjust during troubleshooting.

4-9 MICOM and Pins Voltage

4-9-1 MICOM MODULE Pins

| PIN NO | ITEM | FUNCTION | VOLT |
|--------|------------|----------------------------|----------|
| 1 | KEY 1 | KEY SCAN 1 | 2.28[V] |
| 2 | PROTECT | PROTECT PORT | 0.83[mV] |
| 3 | KEY 2 | KEY SCAN 2 | 2.25[V] |
| 4 | GND | GND | - |
| 5 | KEY 3 | KEY SCAN 3 | 2.29[V] |
| 6 | STB-5[V] | VCC | 4.91[V] |
| 7 | IR IN | REMOCON INPUT | 3.74[V] |
| 8 | POWER | POWER ON/OFF RELAY CONTROL | 1.03[V] |
| 9 | TIMER-LED | TIMER LED | 2.07[V] |
| 10 | 1080 i | 1080i MODE SWITCHING | 2.53[V] |
| 11 | GND | GND | - |
| 12 | V-RESET | VIDEO SIGNAL MUTE | 2.84[mV] |
| 13 | SCL1 | SERIAL CLOCK LINE 1 | 3.43[V] |
| 14 | GND | GND | - |
| 15 | SDA1 | SERIAL DATA LINE 1 | 3.49[V] |
| 16 | S-RESET | SOUND RESET | 4.21[V] |
| 17 | ST-BY-LED | STANDY-BY LED | 2.95[V] |
| 18 | RESET | RESET | 2.47[V] |
| 19 | AMP-MUTE | SOUND AMP MUTE | 0.89[mV] |
| 20 | N.C | N.C | - |
| 21 | GND | GND | - |
| 22 | SW1 | SW1 (CONTROL) | 4.58[V] |
| 23 | SCL2 | SERIAL CLOCK LINE 2 | 3.27[V] |
| 24 | C-SPK-MUTE | CENTER SPEAKER MUTE | 3.26[V] |
| 25 | SDA2 | SERIAL DATA LINE 2 | 3.27[V] |
| 26 | SW3 | SW3 (CONTROL) | 5[mV] |
| 27 | GND | GND | - |
| 28 | SW2 | SW2 (CONTROL) | 2.08[V] |
| 29 | SUB-AFT | SUB AFT CONTROL | 2.57[V] |
| 30 | GND | GND | - |
| 31 | MAIN-AFT | MAIN TUNER AFT CONTROL | 1.04[V] |
| 32 | BUS-STOP | I ² C BUS STOP | 3.27[V] |

| | ITEM | FUNCTION | VOLT |
|----|------------|-------------------------|------------|
| 33 | 5[V] | 5[V] | 4.96[V] |
| 34 | J-BLANK | HORIZONTAL BLANK | 215.8[mV] |
| 35 | GND | GND | - |
| 36 | V-BLANK | VERTICAL BLANK | -12.10[mV] |
| 37 | 2RF-S | 2RF-SWITCHING | 297.68[mV] |
| 38 | GND | GND | - |
| 39 | GND | GND | - |
| 40 | N.C | N.C | - |
| 41 | VS1 | VERTICAL SYNC | - |
| 42 | N.C | N.C | - |
| 43 | HS1 | HORIZONTAL SYNC | 215.51[mV] |
| 44 | N.C | N.C | - |
| 45 | GND | GND | - |
| 46 | S-SW1 | SUB TUNER SWITCH 1 | 3.74[V] |
| 47 | TTX-CVBS | TTX/CAPTION-CVBS | 1.19[V] |
| 48 | GND | GND | - |
| 49 | GND | GND | - |
| 50 | S-SW2 | SUB TUNER SWITCH 2 | - |
| 51 | AV-LINK | NOT USE | - |
| 52 | M-SW1 | MAIN TUNER SWITCH 1 | - |
| 53 | GND | GND | - |
| 54 | M-SW2 | MAIN TUNER SWITCH 2 | - |
| 55 | RXD | RXD | - |
| 56 | GND | GND | - |
| 57 | TXD | TXD | - |
| 58 | OSD-TTX-R | ON SCREEN DISPLAY RED | 168[mV] |
| 59 | GND | GND | - |
| 60 | OSD-TTX-G | ON SCREEN DISPLAY GREEN | 0.46[V] |
| 61 | WP | WRITE PROTECT | - |
| 62 | OSD-TTX-B | ON SCREEN DISPLAY BLUE | 0.46[V] |
| 63 | 3.3[V] | 3.3[V] | 3.26[V] |
| 64 | OSD-TTX-FB | OSD/TTX-FB | 7.31[mV] |

4-9-2 PROSCAN MODULE Pins

| PIN NO | ITEM | FUNCTION | VOLT |
|--------|------------|----------------------------------|------------|
| 1 | EW | EAST WEST OUT | 2.26[V] |
| 2 | V-BLK | VERTICAL BLANK | -12.07[mV] |
| 3 | ABL | ABL(Automtic Brightness Limiter) | 2.26[V] |
| 4 | VD- | VERTICAL DRIVE (- VOLTAGE) | 3.46[V] |
| 5 | VD+ | VERTICAL DRIVE (+ VOLTAGE) | 3.53[V] |
| 6 | H-BLK | HORIZONTAL BLANKING | 215.93[mV] |
| 7 | HD | HORIZONTAL DRIVE | 2.38[V] |
| 8 | GND | GND | - |
| 9 | OSD/TTX-FB | OSD/TTX-FB | 7.29[mV] |
| 10 | OSD/TTX-B | ON SCREEN DISPLAY BLUE IN | 0.46[mV] |
| 11 | OSD/TTX-G | ON SCREEN DISPLAY GREEN IN | 0.46[mV] |
| 12 | OSD/TTX-R | ON SCREEN DISPLAY RED IN | 167.99[mV] |
| 13 | V-RESET | VIDEO SIGNAL MUTE | 2.94[mV] |
| 14 | GND | GND | - |
| 15 | SCL1 | SERIAL CLOCK LINE | 3.42[V] |
| 16 | SDA1 | SERIAL DATA LINE | 3.50[V] |
| 17 | HS1 | HORIZONTAL SYNC | 251.4[mV] |
| 18 | VS1 | VERTICLA OUT | 27.28[mV] |
| 19 | GND | GND | - |
| 20 | CG-R | CONVERGENCE RED | 0.27[mV] |
| 21 | CG-G | CONVERGENCE GREEN | 0.27[mV] |
| 22 | CG-B | CONVERGENCE BLUE | 0.29[mV] |
| 23 | CG-SYNC | CONVERGENCE SYNC | 180.03[mV] |
| 24 | D/F | DYNAMIC FOCUS | 1.5[V] |
| 25 | GND | GND | - |
| 26 | 9[V] | 9[V] | 9[V] |
| 27 | GND | GND | - |
| 28 | N.C | N.C | - |
| 29 | RXD | RXD | - |
| 30 | TXD | TXD | - |
| 31 | GND | GND | - |
| 32 | 13.5[V] | 13.5[V] | 14.05[V] |

| | ITEM | FUNCTION | VOLT |
|----|---------------|-----------------------|----------|
| 33 | 5[V]-DW1 | 5[V]-DW1 | 4.97[V] |
| 34 | VM-Y | VM-Y OUTPUT | 1.97[V] |
| 35 | SW3 | SW3 (CONTROL) | 4.98[mV] |
| 36 | SW2 | SW2 (CONTROL) | 2.08[V] |
| 37 | SW1 | SW1 (CONTROL) | 4.58[V] |
| 38 | GND | GND | - |
| 39 | PIP-C | PIP-C INPUT | 1.20[mV] |
| 40 | PIP-Y/C CVBS | PIP-Y/CVBS INPUT | 1.33[mV] |
| 41 | GND | GND | - |
| 42 | MAIN-C | MAIN-C INPUT | 1.34[mV] |
| 43 | MAIN-Y/C CVBS | MAIN-Y/CVBS INPIUT | 1.57[mV] |
| 44 | N.C | N.C | - |
| 45 | GND | GND | - |
| 46 | N.C | N.C | - |
| 47 | GND | GND | - |
| 48 | RF2-CVBS | RF1-CVBS | - |
| 49 | DVD-Pr/R | DVD-Pr/R (COMPONENT1) | - |
| 50 | DVD-Y/G | DVD-Y/G (COMPONENT1) | - |
| 51 | DVD-Pb/R | DVD-Pr/B (COMPONENT1) | - |
| 52 | FB | NOT USE | - |
| 53 | GND | GND | - |
| 54 | DTV1-Pr | DTV1-Pr (COMPONENT3) | - |
| 55 | DTV1-Y | DTV1-Y (COMPONENT3) | - |
| 56 | DTV1-Pb | DTV1Pb (COMPONENT3) | - |
| 57 | GND | GND | - |
| 58 | DTV2-Pr | DTV2-Pr (COMPONENT3) | - |
| 59 | DTV2-Y | DTV2-Y (COMPONENT3) | - |
| 60 | DTV2-Pb | DTV2-Pb (COMPONENT3) | - |
| 61 | GND | GND | - |
| 62 | 5[V]-DW2 | 5[V]-DW2 | 4.89[V] |
| 63 | DVI-ID | N.C | - |
| 64 | PC-ID | N.C | - |

4-9-3 CONVERGENCE MODULE Pins

| PIN NO | ITEM | FUNCTION | VOLT |
|--------|---------|----------------------|-------------|
| 1 | 5[V]-CG | 5[V]-CG | 5.2[V] |
| 2 | GND | GND | - |
| 3 | D/F | DYNAMIC FOCUS | 1.5[V] |
| 4 | GND | GND | - |
| 5 | SCL1 | SERIAL CLOCK LINE 1 | 3.4[V] |
| 6 | CG-SYNC | CONVERGENCE SYNC | 179[mV] |
| 7 | GND | GND | - |
| 8 | N.C | N.C | 5.2[V] |
| 9 | CG-R | CONVERGENCE RED | 0.27[mV] |
| 10 | CG-G | CONVERGENCE GREEN | 0.26[mV] |
| 11 | CG-B | CONVERGENCE BLUE | 0.29[mV] |
| 12 | SDA1 | SERIAL DATA LINE 1 | 3.5[V] |
| 13 | N.C | N.C | - |
| 14 | IR | INPUT REMOCON | 3.7[V] |
| 15 | N.C | N.C | - |
| 16 | GND | GND | - |
| 17 | GND | GND | - |
| 18 | GND | GND | - |
| 19 | BV | BULE VERTICAL OUT | 34.27[mV] |
| 20 | BH | BULE HORIZONTAL OUT | -107.32[mV] |
| 21 | GV | GREEN VERTICAL OUT | 101.52[mV] |
| 22 | GH | GREEN HORIZONTAL OUT | -15.83[mV] |
| 23 | RV | RED VERTICAL OUT | 104.32[mV] |
| 24 | RH | RED HORIZONTAL OUT | -88.95[mV] |
| 25 | GND | GND | - |
| 26 | H-BLK | HORIZONTAL BLANK | 275[mV] |
| 27 | V-BLK | VERTICAL BLANK | -13.22[mV] |
| 28 | GND | GND | - |
| 29 | N.C | N.C | - |
| 30 | -5[V] | -5[V] | -4.99[V] |
| 31 | 5[V] | 5[V] | 5.24[V] |
| 32 | GND | GND | - |

MEMO