Wells-Gardner Electronics Corporation

Service Manual for
D9300 Series
Digital-Control Color Monitor

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1. SAFETY PRECAUTION:

WARNING: Service should not be attempted by anyone unfamiliar with the necessary precautions on this unit. The following precautions are necessary during servicing.

1-1 Some parts, such as a picture tube in this unit, have special safety-related characteristics for X-RAY RADIATION protection.
For continued safety, the parts replacement should be undertaken referring to below article (1-2 and 1-5).

1-2 Many electrical mechanical parts in this unit have special safety-related characteristics for protection against shock hazard and others. These characteristics are often passed unnoticed by visual inspection and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special characteristics are identified in the manual and supplements by shading on the schematic diagram and the parts list. Before replacing any of these components, read the parts list in this manual carefully.

1-3 When replacing the chassis in the cabinet, always be certain that all the protective devices are installed properly, such as insulating covers, strain relief, etc.

1-4 Before replacing the back cover of the set, thoroughly inspect the inside of the cabinet to see that no stray parts or tools have been left inside.

1-5 Before returning the set to the customer, always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as terminal, screwheads, metal overlays, control shafts, etc. To insure the set is safe to operate without danger of electrical shock, plug the AC line cord directly into a 120V AC outlet (do not use a line isolation transformer during this check). Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner. Connect a 1500 ohm, 10 watt resistor, parallel with a (0.15uF) capacitor. Reverse the AC plug in the AC outlet and repeat the AC voltage measurements for each exposed metallic part. Voltage measured must not exceed 0.3V RMS. This corresponds to 0.2mA AC, any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.

2. SPECIFICATION:

2-1 Picture Tube.

- Size: 18V
- Dot Pitch: .25mm

2-2 Signal Input.

- Video Input: Analog, Positive Signal (0.7V p-p)
- Horizontal Sync: TTL Level, Positive or Negative Pulse
- Scanning : 28 KHz-70KHz
- Vertical Input: TTL Level, Positive or Negative pulse
- Scanning : 40-160Hz

2-3 Power Supply.

- Power Input : 120-240 VAC, 50/60Hz
- Fuse Rating: 250V, 3.15A
- Power Consumption
  Normal : less than 130W

2-4 OSD (On Screen Display) Control:

Refer to page 7

2-5 Operating Temperature: 0°C - 55°C

2-6 Operating Humidity: 10% - 90% (Noncondensing)

2-7 Net Weight : 17kg (37lbs)

3. TECHNICAL FEATURES:

3-1 Microprocessor control with OSD (On screen display menu).
Microprocessor recognizes the input computer signal and signal output from the customer control board connected to the main board by a flat cable.

3-2 Universal AC Input Voltage.
Power supply operates on 120-240 VAC at 60/50Hz for use all over the world.

3-3. Protection Circuit for over-current.
When an over-current condition occurs in the circuit, the protection circuit operates in order to prevent the components from electrical shock or other risks.

3-4 Override function.
A (NO SIGNAL MESSAGE) is displayed on the screen if no signal is present at the signal input cable while the monitor is powered on.

3-5 Control panel.
If you require different display characteristics other than the factory mode presets of size, position, color settings, use the control panel to program it to your requirements in each resolution mode. These adjusted settings are kept in memory even if you change resolution mode or turn off the monitor.

3-6 I²C BUS control.
The monitor is designed with I²C BUS control for simplifying the circuitry.
The number of total components is less than 610 pcs.

4. TIMING CHART:

Factory Pre-Set Timing Modes.
Horizontal and Vertical Timing Diagram for Table 1

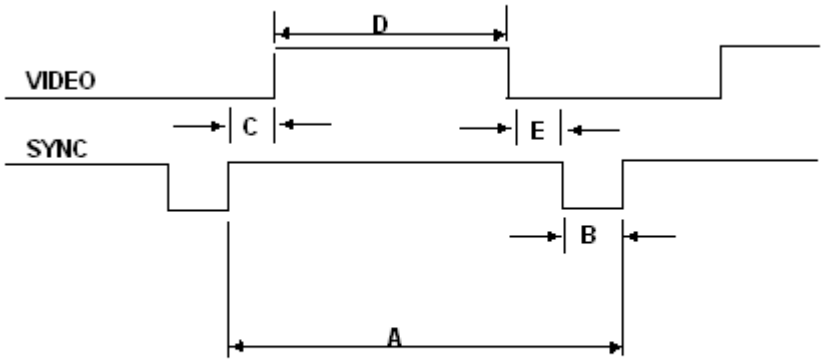

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TABLE 1 :

QUANTUM 801GX FORMAT		MVP-NSW	US500	MK6	VGA_M4
DESCRIPTION		MODE 1 640*400	MODE 2 640*400	MODE 3 640*480	MODE 4 8514/A 1024*768
H	FH	29.63Hz	31.5KHz	31.35KHz	35.552KHz
	A	33.75*µs*	31.778*µs*	28.251*µs*	28.251*µs*
	B	*1.76µs*	3.88µs	3.86*µs*	3.920*µs*
	C	*3.52µs*	1.84*µs*	*2.04µs*	1.247*µs*
	D	26.67*µs*	25.4*µs*	25.5*µs*	22.806*µs*
	E	*1.86µs*	0.63*µs*	0.58*µs*	0.170*µs*
	POL.	POSITIVE	POSITIVE	POSITIVE	POSITIVE
V	FV	62.91Hz	70.1Hz	59.8Hz	86.960Hz
	A	15.88ms	14.2ms	16.72ms	11.500ms
	B	0.0338ms	0.0636ms	0.066ms	0.113ms
	C	1.680ms	1.110ms	1.052ms	0.563ms
	D	13.56ms	12.7ms	15.36ms	10.810ms
	E	0.675ms	0.408ms	0.316ms	0.014ms
	POL.	POSITIVE	POSITIVE	POSITIVE	POSITIVE
	VIDEO	ANALOG	ANALOG	ANALOG	ANALOG

QUANTUM 801GX FORMAT		VG900602	DMT8075	VS900603	VG901101	VG901101
DESCRIPTION		MODE 5, S-VGA VESA 680*480	MODE 6 VGA 800*600	MODE 7 VGA VESA 800*600	MODE 8 VESA 800*600	MODE 9 VESA 1024*768
H	FH	37.500KHz	37.879KHz	46.875KHz	48.077KHz	48.363KHz
	A	26.667us	26.400µs	21.333µs	20.800µs	20.677µs
	B	2.032us	3.200µs	1.616µs	2.400µs	2.231µs
	C	3.810us	2.200µs	3.232µs	1.280µs	1.615µs
	D	20.317us	20.000µs	16.162µs	16.000µs	15.754µs
	E	0.508us	1.000µs	0.323µs	1.119µs	0.998µs
	POL.	NEGETIVE	POSITIVE	POSITIVE	POSIIVE	NEGATIVE
V	FV	75.00Hz	60.317Hz	75.000Hz	72.188Hz	60.004Hz
	A	13.333ms	16.579ms	13.333ms	13.853ms	16.666ms
	B	0.080ms	0.106ms	0.064ms	0.125ms	0.124ms
	C	.427ms	0.607ms	0.448ms	0.478ms	0.600ms
	D	12.800ms	15.840ms	12.800ms	12.480ms	15.880ms
	E	0.027ms	0.026ms	0.021ms	0.722ms	0.062ms
	POL.	NEGETIVE	POSITIVE	POSITIVE	POSITIVE	NEGATIVE
	VIDEO	ANALOG	ANALOG	ANALOG	ANALOG	ANALOG

QUANTUM 801GX FORMAT		DMT8085	VS910801	DMT1075	DMT1260	DMT1085
DESCRIPTION		MODE 10 VESA 800*600	MODE 11 VESA 1024*768	MODE 12 VESA 1024*768	MODE 13 VESA 1280*1024	MODE 14 VESA 1024*768
H	FH	53.674KHz	56.476KHz	60.023KHz	63.981KHz	68.677KHz
	A	18.631µs	17.707µs	16.660µs	15.698µs	14.561µs
	B	1.138µs	1.813µs	1.219µs	1.037µs	1.016µs
	C	2.702µs	1.920µs	2.235µs	2.296µs	2.201µs
	D	14.222µs	13.653µs	13.003µs	11.852µs	10.836µs
	E	0.569µs	0.321µs	0.203µs	0.360µs	0.508µs
	POL.	POSITIVE	NEGATIVE	POSITIVE	POSITIVE	POSITIVE
V	FV	85.062Hz	70.069Hz	75.029Hz	60.020Hz	84.997Hz
	A	11.756ms	14.272ms	13.328ms	16.638ms	11.765ms
	B	0.056ms	0.106ms	0.050ms	0.047ms	0.044ms
	C	0.503ms	0.513ms	0.466ms	0.594ms	0.524ms
	D	11.179ms	13.599ms	12.795ms	16.005ms	11.183ms
	E	0.019ms	0.054ms	0.017ms	0.016ms	0.015ms
	POL.	POSITIVE	NEGATIVE	POSITIVE	POSITIVE	POSITIVE
	VIDEO	ANALOG	ANALOG	ANALOG	ANALOG	ANALOG

5. SET UP:

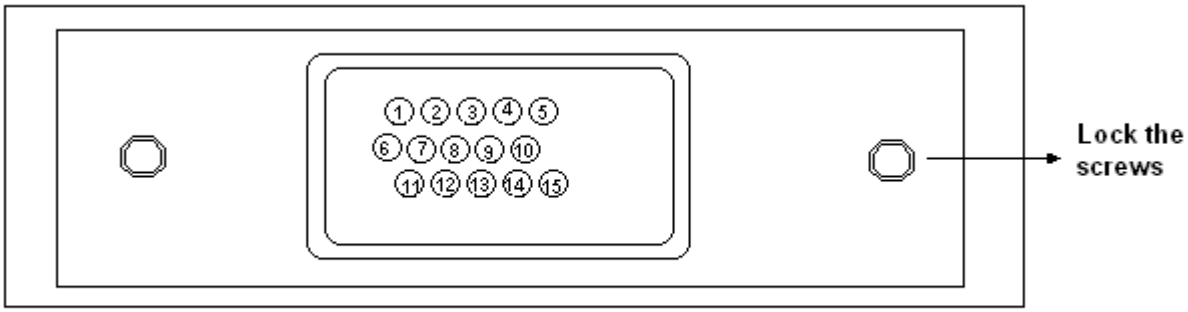
Setting up your monitor is easy. All you have to do is make a few simple connections and adjustments. The procedure is as follows:

5.1 Start Up.

Your monitor starts up automatically when you insert the power plug to power source.

5-2. Single Cable Connection.

Connect the 15pin signal cable to the source and lock both screws to ensure that the monitor is properly grounded.



D type 15pin connector:

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	VIDEO RED	9	N.C.
2	VIDEO GREEN	10	GROUND
3	VIDEO BLUE	11	N.C.
4	N.C.	12	SDA
5	N.C.	13	HOR-SYNC
6	VIDEO RED GROUND	14	VER-SYNC
7	VIDEO GREEN GROUND	15	SCL
8	VIDEO BLUE GROUND		

6. CONTROLS AND ADJUSTMENTS:

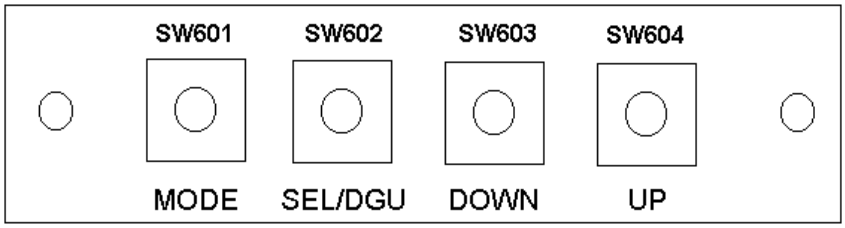
There are four switches on the control panel. Adjustable controls allow the best display status for individual requirements.

6-1. Key Function.

1. MODE/EXIT
MODE – Call the Main-Menu OSD

2. SEL / Degauss
SEL – Call the Sub-Menu OSD
Degauss – Degausses the CRT (active when the OSD is not displayed)

3. DOWN/UP
When the Main-Menu is displayed, you can select each function using these keys.
When the Sub-Menu is displayed, you can change the amplitude of the selected function of the screen using these keys.



6-2. O.S.D. CONTROL METHOD.

User Adjustment.

Location	Adjustment Method	Function
CUSTOMER CONTROL PCB	OSD CONTROL	Brightness Contrast Horizontal Position Horizontal Size Vertical Position Vertical Size Side Pincushion Trapezoid Pin Balance Parallelogram
MAIN PCB	VR control, VR501 VR301 FBT VR302	Sub-Bright H.V. Adjustment* Focus and Screen Tilt

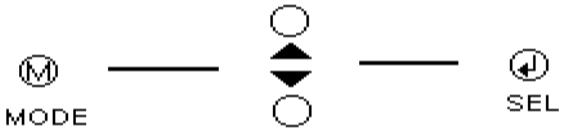
***NOTE: (FACTORY ADJUSTED AND EPOXYED VR301)**
(HOT MELTED SCREEN FBT)

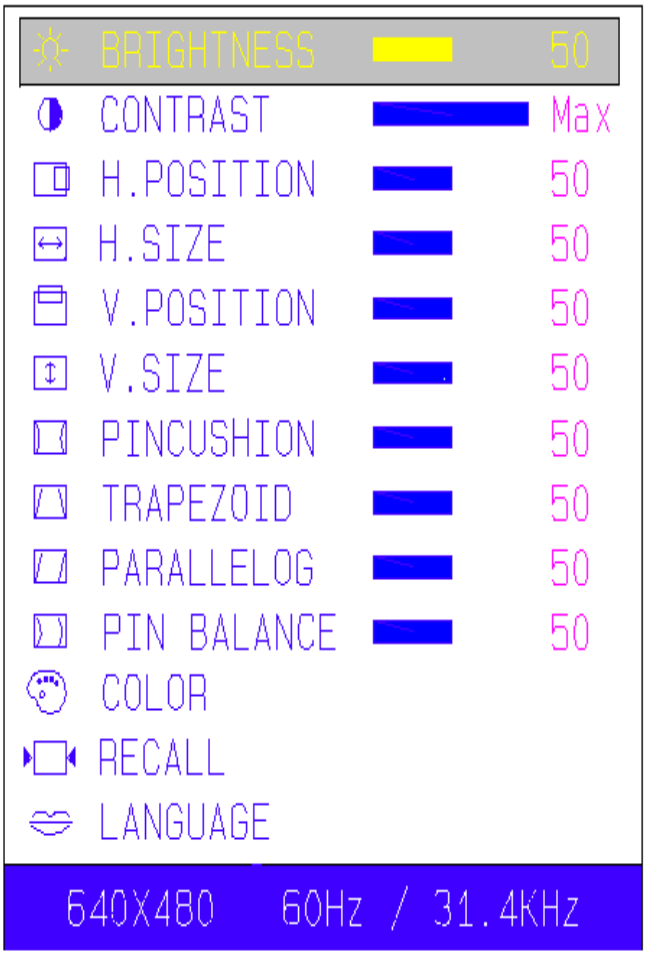
6-3. OSD Controls
- User's control.

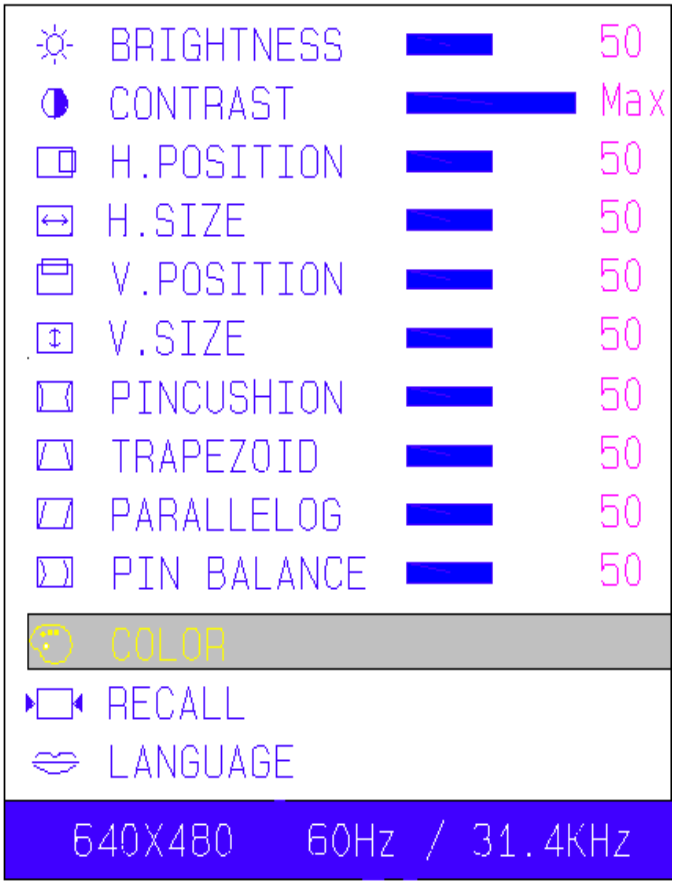
A. BRIGHTNESS ADJUSTMENT.

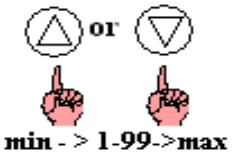
1) **Press the "MODE" key then Main-Menu OSD comes out as figure on next page.**
2) **Search "BRIGHTNESS" sub-menu using "UP/DOWN" key on the Main-Menu OSD.**
3) **Select the "BRIGHTNESS" by pressing "SEL" key. The "BRIGHTNESS" OSD color changes from yellow to red.**
4) **Adjust Brightness as much as you want using "UP/DOWN" key.**
5) **After finishing the Brightness adjust, press the "MODE" key. The "BRIGHTNESS" OSD color changes from red to yellow and the changed Brightness value saves automatically.**
6) **If you want to adjust other functions (sub-menu), search the function using "UP/DOWN" keys, and then repeat the same procedures of steps 3-5.**
7) **Press the "MODE" key again to finish adjustments and the OSD will disappear. If no action is taken in the OSD, the menu will disappear by itself.**

A. BRIGHTNESS ADJUSTMENT









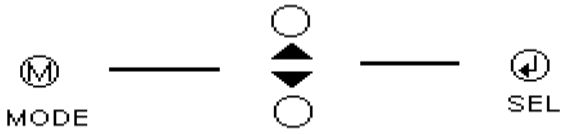
B.	**CONTRAST**	**ADJUST**	**SAME ABOVE**
C.	**H. POSITION**	**ADJUST**	**SAME ABOVE**
D.	**H. SIZE**	**ADJUST**	**SAME ABOVE**
E.	**V. POSITION**	**ADJUST**	**SAME ABOVE**
F.	**V. SIZE**	**ADJUST**	**SAME ABOVE**
G.	**PINCUSHION**	**ADJUST**	**SAME ABOVE**
H.	**TRAPEZOID**	**ADJUST**	**SAME ABOVE**
I.	**PARRALLELOG**	**ADJUST**	**SAME ABOVE**
J.	**PIN BALANCE**	**ADJUST**	**SAME ABOVE**

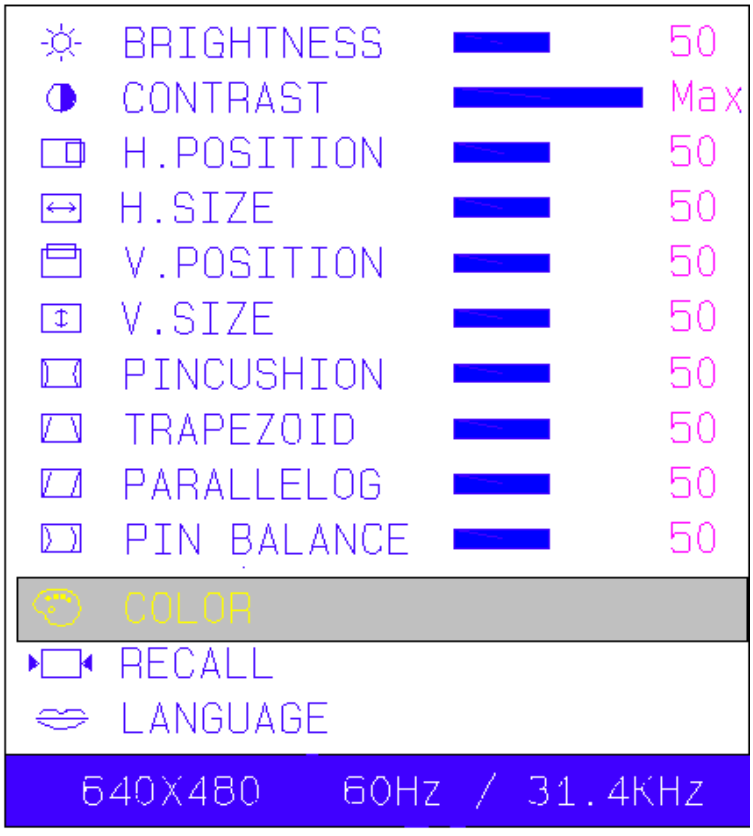
6-3 OSD Controls (continued):

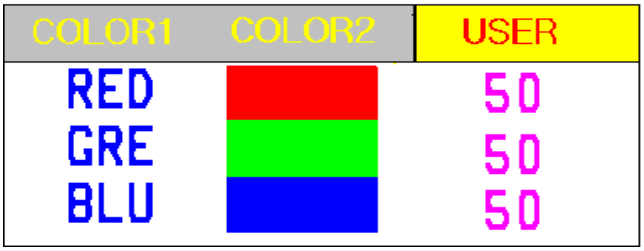
K. COLOR ADJUSTMENT

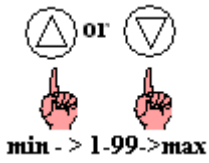
1) **Press the "MODE" to show the Main-Menu OSD as shown by the left-below figure.**
2) **Search the "COLOR" sub-menu using "UP/DOWN" key on the Main-Menu OSD.**
3) **SELECT the "COLOR" by pressing "SEL" key. The color Sub-Menu OSD appears as shown by the right-below figure.**
4) **Search "USER" using "UP/DOWN" key. ("COLOR1" and "COLOR2" are adjusted in factory by auto-alignment machine.)**
5) **Press "SELECT" key to adjust "RED", "GREEN" and "BLUE". Each is selected by pressing the "SELECT" key. The selected item changes OSD color from white to shown it's own color as the character. (ex. "RED" goes red in color).**
6) **Adjust "RED", "GREEN" or "BLUE" using "UP/DOWN" key.**
7) **Press "MODE" key to finish the color adjustment. The OSD will then go back to the Main-Menu.**
8) **Press the "MODE" key again to finish adjustments and make the OSD disappear.**

COLOR ADJUST









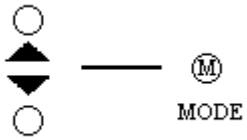
L. RECALL.

When the "RECALL" key is pressed, all user's adjustment values are changed to the factory values.

M. LANGUAGE.

The menu is available in four languages.

1. **Press the "MODE" key and the Main-Menu OSD will appear as in the previous figure.**
2. **Search the "LANGUAGE" sub-menu using the "UP/DOWN" key on the Main-Menu OSD.**
3. **Select the "LANGUAGE" by pressing the "SEL" key. Then the Language sub-menu will appear as in the following figure**
4. **Search any language using the "UP/DOWN" key.**
5. **Select a language by pressing the "SEL" key.**
6. **Press "MODE" key to finish and save the selected language.**
   Then the OSD will return to Main-Menu in the selected language.
   Press the "MODE" key again to finish the adjustment then the OSD will disappear.



7. ADJUSTMENT SPECIFICATION:

7-1. Adjustment Sequence:
The monitor requires a min. of 15 minutes warm up time before adjustment.

7-2. Adjustment Sequence:
FBT B+ Voltage → G2 Voltage → Hor. Center → Hor. Size → Hor. Position → Ver. Size → Ver. Position → Side-pin → Trapezoid → Focus → White Balance → Convergence (if needed).

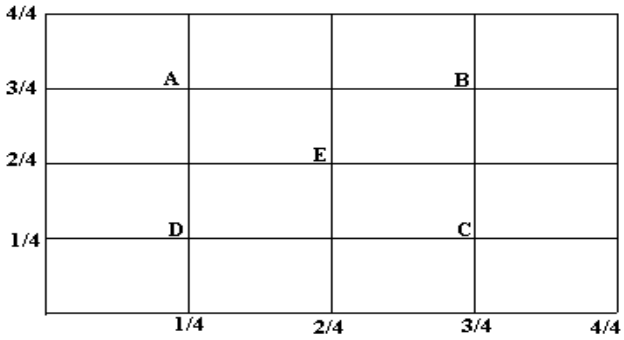
7-3. Adjustment Procedure - How to enter the Factory Mode:
Press Menu and Down simultaneously and hold down for three seconds. Adjust BRIGHTNESS and CONTRAST to "50" amplitude. Factory mode is active when the bottom line of the menu is red. Blue indicates user mode.

7-3.1 FBT B+ voltage adjustment. (Flyback Replacement Only – Pot is Glued)
1. **Input the crosshatch pattern with the 48KHz 1024x768 mode.**
2. **After connecting a digital voltmeter to D316, cathode and the frame ground, adjust FBT B+ voltage to 110V +/- 0.5V using VR301.**

7-3.2 G2 and G1 Voltage adjustment.
1. **Input the crosshatch pattern with 48 kHz 1024x768 mode**
2. **Adjust the G2 for visible background.**
3. **Adjust G1, VR501, for –35 +/- 1vdc**

7-3.3 Geometry/Display Adjustment.
Refer to controls and adjustment (Article 6)

7-3.4 Focus Adjustment
1. **Input the "H" character pattern with 48 kHz 1024x768**
2. **Adjust the focus for the best balance at each point of A,B,C,D,E as shown below by rotation the focus VR of FBT**
3. **For Dual Focus 17" monitors, adjust FOCUS 1 and FOCUS 2 for sharpest horizontal and vertical lines on a crosshatch pattern in oval area from point B to point C of display. Check overall focus in center and corners.**



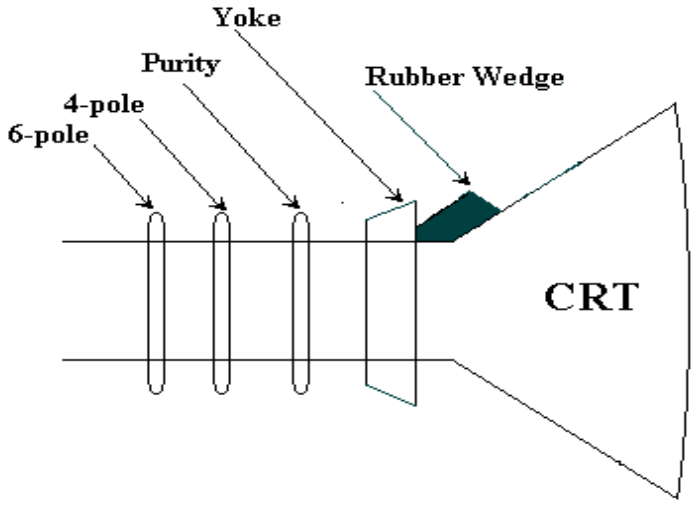
7-3.5 Purity and Convergence Adjustment. (If Required)

A. Purity Adjustment.

1. **Demagnetize the picture tube and cabinet using a degaussing coil.**
2. **Turn the CONTRAST and BRIGHTNESS controls to maximum.**
3. **In User Color Menu, adjust RED and BLUE controls to provide only a green raster.**
4. **Loosen the clamp screw holding the yoke and slide the yoke backward to provide vertical green belt (zone) in the picture screen.**
5. **Remote the Rubber wedges**
6. **Rotate and spread the tabs of the purity magnet around the neck of the picture tube until the green belt is in the center of the screen. At the same time, center the raster vertically.**
7. **Move the yoke slowly forward until a uniform green screen is obtained. Tighten the clamp screw of the yoke temporarily.**
8. **Check the purity of the red and blue raster by adjusting COLOR controls.**
9. **Obtain a white raster referring to "CRT GRAY SCALE ADJUSTMENT"**
10. **Proceed with convergence adjustment.**

B. Convergence adjustment:

1. **Change to a crosshatch pattern with a color signal generator.**
2. **Adjust the BRIGHTNESS and CONTRAST controls for well defined pattern.**
3. **Adjust two tabs of the 4-pole magnets to change the angle between them and superimpose red and blue vertical lines in the center of the picture screen.**
4. **Turn both tabs at the same time keeping their angles constant to superimpose red and blue horizontal lines at the center of the screen.**
5. **Adjust two tabs of 6-pole magnets to superimpose red/blue line with green one. Adjusting the angle affects the vertical lines and rotating both magnets affects the horizontal line.**
6. **Repeat adjustments 3,4 and 5, keeping in mind red, green and blue movement, because 4-pole magnets and 6-pole magnets interact and make dot movement complex.**



7-3.6 White Balance adjustment (video).

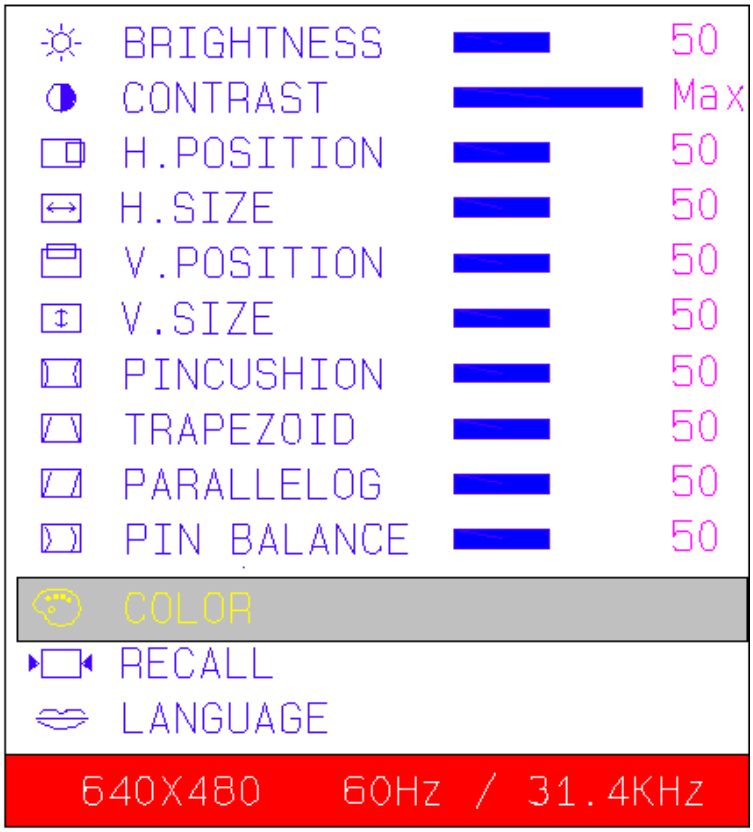
1. **Warm up the unit for 15 minutes**
2. **Input the window pattern with 31KHz 640*480 mode.**
3. **Adjust the color temperature to be X=0.285+/-0.015 and Y=0.293+/-0.015 by R.G.B. gain on User Color Menu or User Preference.**

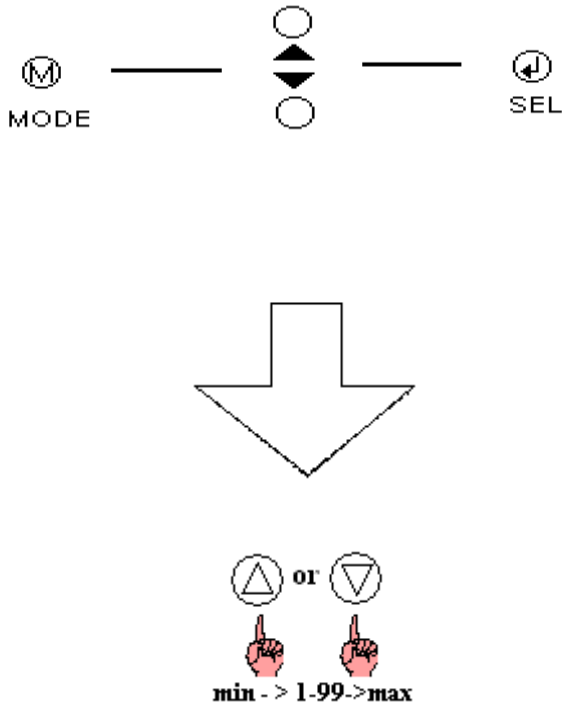
7-4 OSD FACTORY CONTROL

This should be adjusted by a technician or qualified repair personnel.

This monitor has two-adjustment modes.
One is for the user's own adjustment and other is for factory adjustment.
But sometimes adjustments in the factory adjustment modes are needed for repair.
Caution: More precautions must be made in the factory adjustment mode compared to the user mode, because after finishing adjustments in the factory mode, if wrong values have been entered, you can not revert back to the old settings. At the user mode, if there are mistakes, you can use the "RECALL" function (refer to 6-3 M item) to go back to the previous settings. In factory mode, the "RECALL" function will only display your current settings.

A. Factory mode entering.
Press the "MODE" and "DOWN" key simultaneously until the OSD comes out as below. The OSD of factory mode is the same format with user mode except for the color of the bottom line. (User mode is blue; factory mode is red).





B. Exit and save. (Save is automatic)

1. **After finishing adjustments, select "RECALL" using "UP/DOWN" key.**
2. **Press "SEL" key until OSD disappears. The adjusted value is saved and exits from the factory mode.**

C. Adjustment.
All adjustment methods are same as user's control mode except "COLOR"

7-5 White balance Adjustment:

A. Pre-adjustment.

1. **Warm up monitor for 15 minutes.**
2. **Input the small window pattern with 31KHz 640*480 mode.**
3. **Degauss the screen with External degaussing coil.**

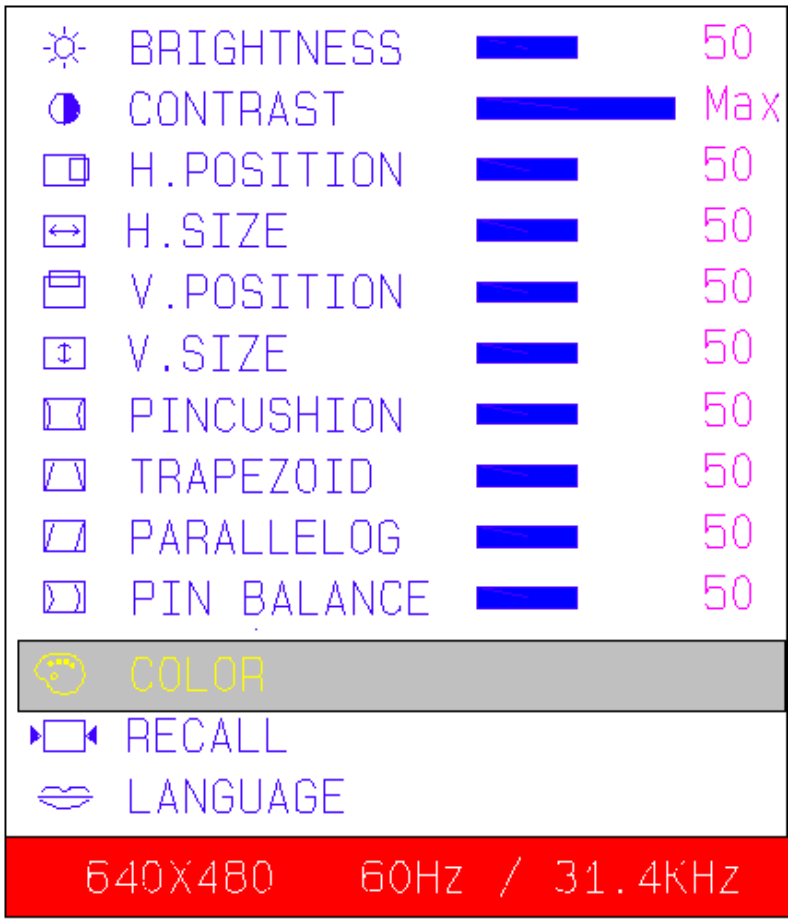
White Balance adjustment (background raster).

1. **Remove the video signal.**
2. **Adjust the sub-brightness of background raster to be 1.0FtL +/- 0.3FtL with SUB BRIGHTNESS control VR501.**

B. COLOR ADJUSTMENT.
COLOR 1 - 8500°K: X=0.285, Y=0.294
COLOR 2 - 6500°K: X=0.312, Y=0.329
Check at 2.5fL (BIAS), 50fL (GAIN) light output levels.
Reference size, Horizontal = 361mm +/- 4 mm from CRT phosphor edges.
Vertical = 270mm +/- 4mm from CRT phosphor edges.

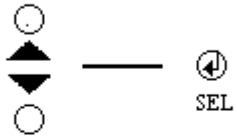
1. **It is best to use a centered small white box pattern. Before adjusting the "COLOR". "CONTRAST" should be set at the maximum and "BRIGHTNESS" should be set to "50".**
2. **In the factory mode, toggle down to "COLOR" using "UP/DOWN" key.**
3. **Select "COLOR" by pressing "SEL" key. Color sub-menu appears as left below figure.**
4. **Search a color temperature you want to adjust (gain or bias) using "UP/DOWN" ("GAIN" is the high-beam area's adjustment and "BIAS", the low-beam.)**
5. **Select any item desired by pressing "SEL" key then the OSD changes to the sub-menu as shown in figure below-right.**
6. **Adjust color temperature using "SEL" and "UP/DOWN" key. ("SEL" key: moves item position, "UP/DOWN" key: changes value.)**
7. **In the "GAIN" mode, "CO" means sub-contrast adjustment. Sub-contrast is adjusted using "UP/DOWN" key.**
8. **Press the "MODE" key to finish the "GAIN" or "BIAS" adjustment.**
9. **If you want to adjust other "GAIN" or "BIAS", repeat from steps 4-8.**
10. **Press "MODE" key again to finish the "COLOR" adjustment.**
11. **When done with the factory adjustment, select "RECALL" as in step B."Exit and save".**

7-5 B. Color Adjustment



COLOR SUB-MENU

8500 GAIN	8500 BIAS
6500 GAIN	6500 BIAS



GAIN SUB-MENU

RG	GG
BG	CO

OR

BIAS SUB-MENU

RB	GB
BB	

"SEL" and "UP/DOWN"

8.DESCRIPTION OF CIRCUIT OPERATION:

8-1. Mode Control.

8-1.1 H-Sync is inputted to pin 30 of IC601, V-Sync to pin 29 of IC601 for each mode and pin 27, 26 of IC601 output always positive polarity sync.

8-1.2 The outputs from IC601 are as below (See table below)

No.	Frequency		Resolution	Range of Frequency		OUTPUT (MCU PIN)						
	Hf KHz	Vf Hz		Hf (KHz)	Vf (Hz)	(CS3) 38	(CS2) 39	(CS1) 40	OFF 5	ST-BY 3	SUS-P 4	LED 6
1	31	70	720x400	28 ~32.9	68 ~ 72	L	L	L	L	H	L	L
2	31	60	640X480	"	58 ~ 62	L	L	L	L	H	L	L
3	35	86	1024X768	33 ~ 35.9	84 ~ 88	H	L	L	L	H	L	L
4	38	75	640X480	36 ~ 40.9	73 ~ 77	H	H	L	L	H	L	L
5	38	60	800X600	36 ~ 40.9	58 ~ 62	H	H	L	L	H	L	L
6	47	75	800X600	41~ 51.9	73 ~ 77	H	L	H	L	H	L	L
7	48	72	800X600	"	70 ~ 74	H	L	H	L	H	L	L
8	48	60	1024X768	"	58 ~ 62	H	L	H	L	H	L	L
9	53	85	800X600	52 ~ 61.9	83 ~ 87	L	H	H	L	H	L	L
10	56	70	1024X768	"	68 ~ 72	L	H	H	L	H	L	L
11	60	75	1024X768	"	73 ~ 77	L	H	H	L	H	L	L
12	64	60	1280x1024	62 ~ 70	58 ~ 62	H	H	H	L	H	L	L
13	69	85	1024x768	62 ~ 70	83 ~ 87	H	H	H	L	H	L	L

8-2 Deflection Processor (IC301):

8-2.1 Horizontal section.

8-2.1.2 Horizontal Oscillation.

Horizontal free frequency is set to 48KHz by R314 and C347. Auto-sync processing can be done from 28KHz to 70KHz by means of IC301 without any adjustment.

8-2.1.3 Phase Shift.

Horizontal phase shift is controlled by IC601 using I²C BUS control.

8-2.1.4 Horizontal driver output.

The output pulse having the duty-cycle of 47% is available at pin 26 of IC301
The output is used by the horizontal drive circuit.

8-2.1.5 B+ control driver output.

The output pulse is available at pin 6 of IC301 and it is used for the horizontal scan voltage control driver.

8-2.1.6 X-Ray protection.

When the flyback voltage rises up to an unacceptable level, X-ray protection is activated. When the X-ray input pin 25 of IC301 is above 8V, the internal latch in IC301 is turned on. This stops all line drive output to the horizontal circuits. To reset the protection circuit, remove main power to the monitor for 5 seconds.

8-2.2 Vertical section:

8-2.2.1 Vertical oscillation.

The free running frequency of the vertical oscillator is determined by the capacitor C342 at pin VCAP (pin22) of IC301.

8-2.2.2 Vertical amplitude.

Vertical amplitude is controlled by IC601 using I²C bus control.

8-2.2.3 Vertical position.

Vertical position is controlled by IC601 using I²C bus control.

8-2.2.4 East-west parabola.

A parabola wave-form is available on pin 24 of IC301 for driving the pincushion correction stage. Amplitude of parabola waveform is controlled by IC601 using I²C.

8-2.3 B+ Regulator.

B+ PWM regulator output is available on pin 28 of IC301 for driving the B+ control stage. This PWM output is adjusted through VR301.

8.3 Vertical Deflection (IC201):

IC201 (KA2142) is used for direct driving of the vertical deflection yoke.

8-4 Horizontal scan voltage control stage:

The set-up converter is used in this stage. The output pulse at pin 28 of the IC301 is synchronized on horizontal frequency. This pulse is operated via buffer stage Q311/Q312. This output is rectified through D315/L304.
In this way, the supply voltage to the flyback transformer can be proportional to the horizontal line frequency.

8-5 Horizontal deflection output stage:

8-5.1 Line driver stage.

As a driver device, small MOSFET Q307(IRF630A) is used.
The driver transformer T302 is equipped with a snubber circuit (R327/C309) at the primary side to damp excessive ringing.

8-5.2 Horizontal power output stage.

The horizontal power output stage is a conventional one with a diode modulator.
As a deflection transistor, the Q308 (KSC3997) is used.
To compensate for horizontal linearity, T301 is connected in series with the horizontal DY. It is controlled by DC voltage of Q304 collector, which the base voltage of Q304 is integrated from output at pin 40 of IC601.

8-5.3 S-Correction capacitor switches.

Q316 is off when horizontal frequency is 35KHz
Q316, Q317 are off when horizontal frequency is 37KHz
Q316, Q318 are off when horizontal frequency is 43KHz-52KHz

Q317, Q318 are off when horizontal frequency is 53KHz ~ 61KHz
Q316, Q317, Q318 is off when horizontal frequency is 62KHz ~70KHz

8-6 FBT (Flyback Transformer):

The high voltage for CRT anode focus, G2 voltage for CRT and – 12V for vertical deflection are generated by the FBT. Also, -130V for G1 voltage, horizontal flyback pulse, +128V video supply, and for dual focus units 800V dynamic focus supply.

8-7 ABL (Automatic Beam Limiting):

The voltage of point 7 depends on the anode current of FBT. So, the voltage at pin 7 of the FBT decreases with increasing anode current. That time, using at this level, increase contrast setting level limited a certain level (32FtL in white pattern) that is set by inner voltage of IC401.

8-8 Video amplification section:

8-8.1 Video pre-amplifier(IC401).

Input video signals are amplified by means of IC401, and the amplified signals drive the video output stage (IC402). Video gain is adjusted by DC voltage at pin 12 for ABL control.

8-8.2 Video output stage (IC402).

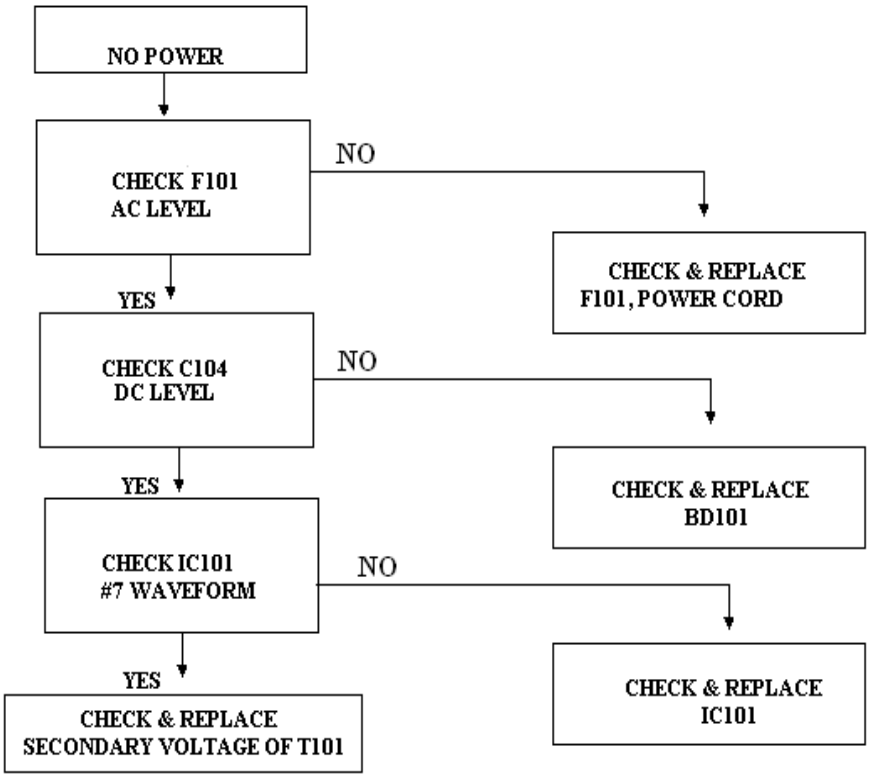
The video output signals from IC401 are amplified again by IC402, and IC402 applies video signals to each cathode of the CRT. Cutoff voltages are adjusted by Q405, Q406 and Q407 which is operated by I²C BUS control through the microprocessor.

8-8.3 OSD (On Screen Display : IC403).

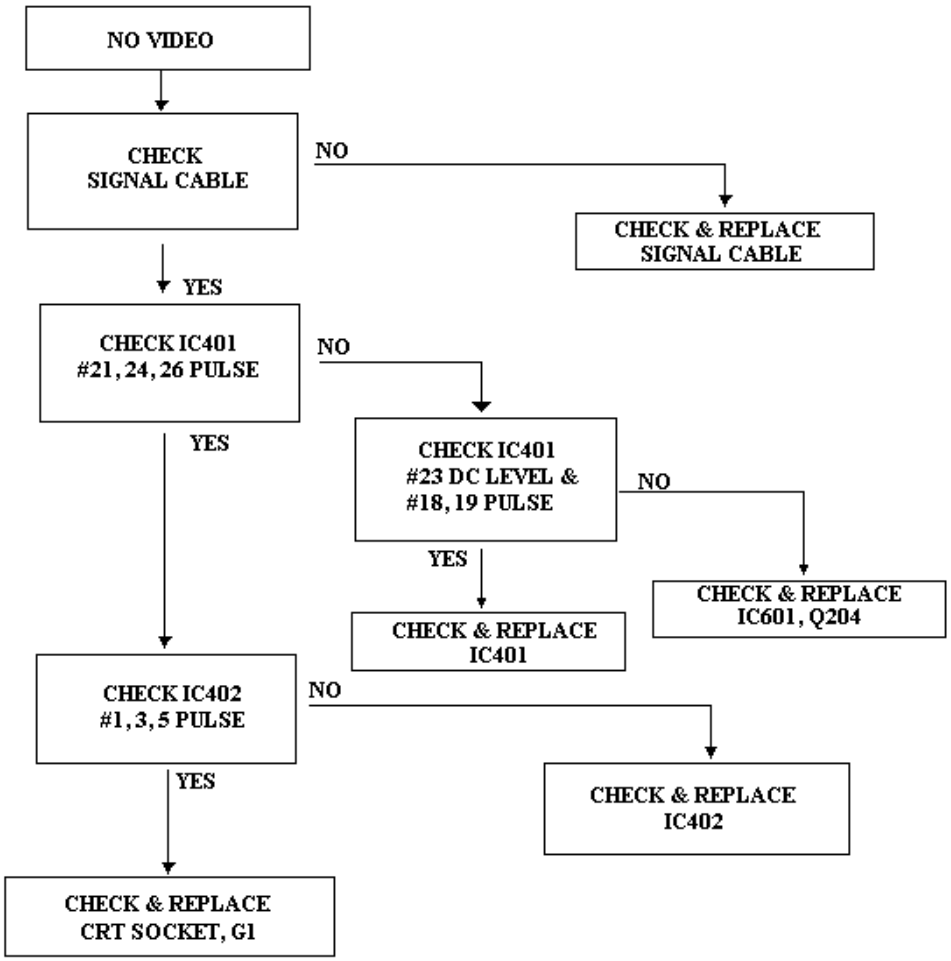
The OSD signal is applied from IC403 to IC402. It is controlled by I²C BUS control line.

9. TROUBLESHOOTING:

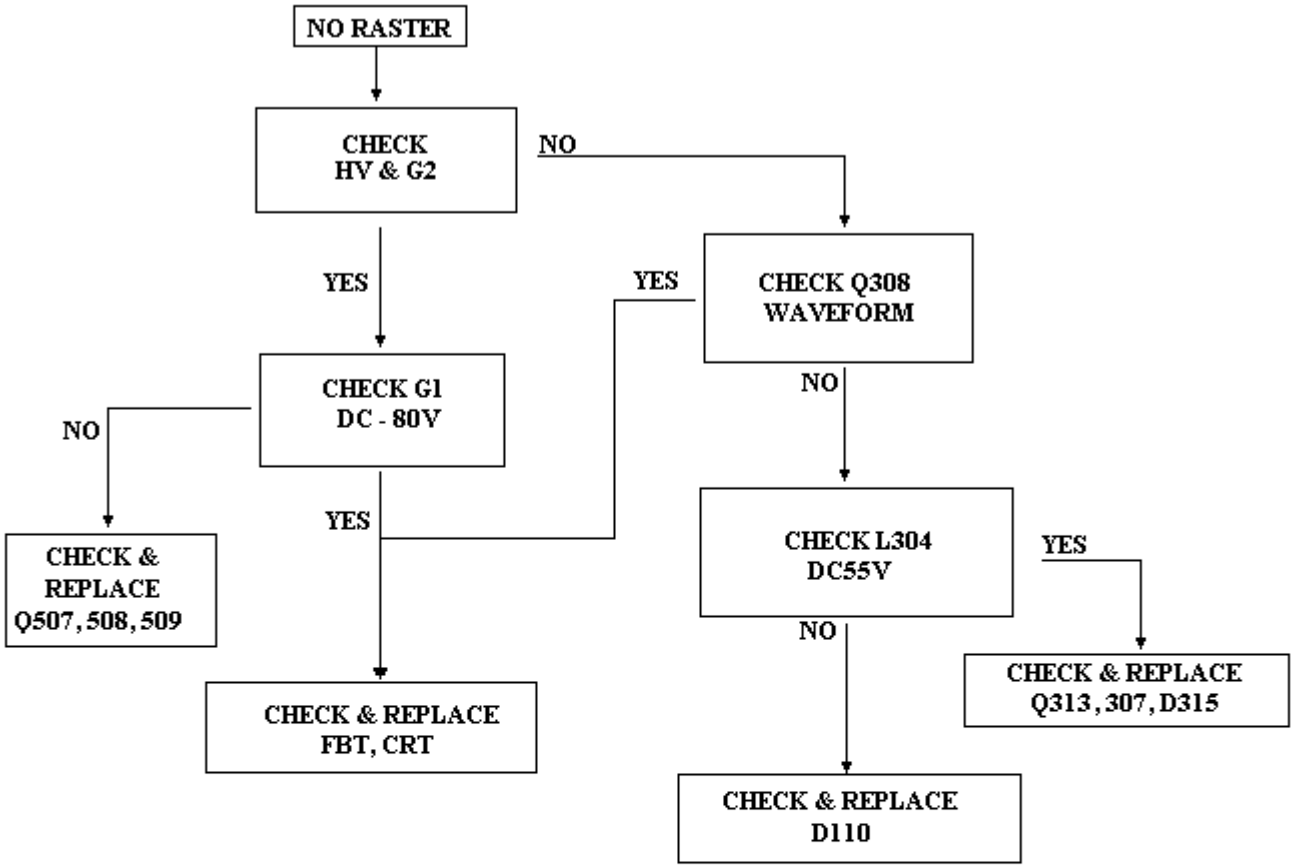
9-1. NO POWER.



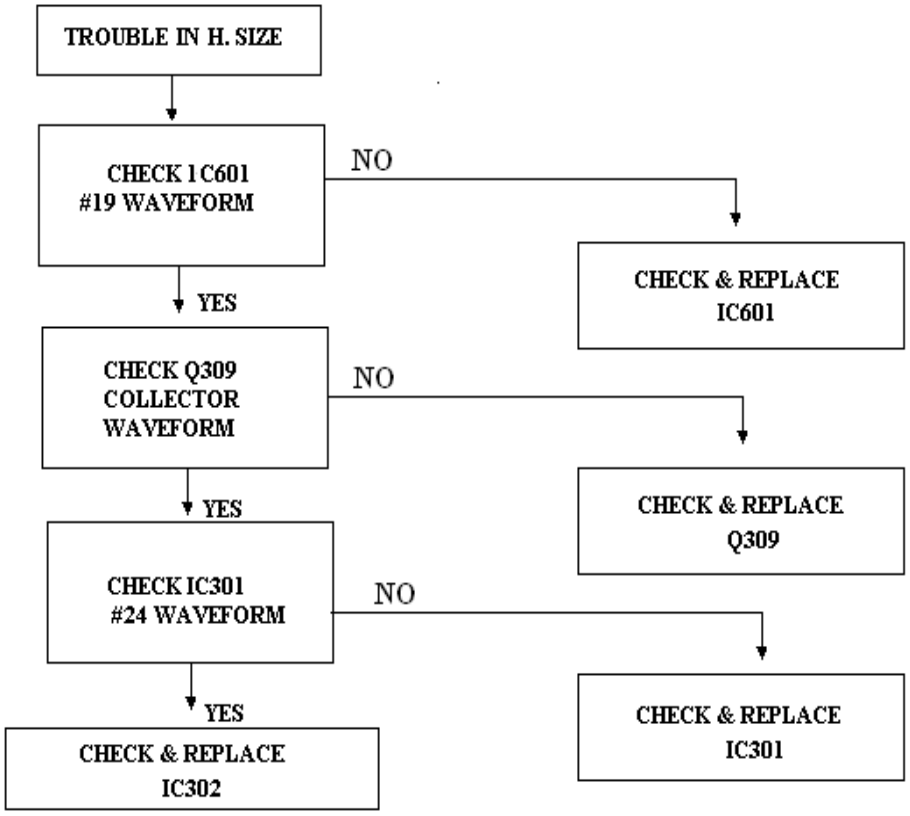
9-2. NO VIDEO.


NO VIDEO
CHECK SIGNAL CABLE
NO
CHECK & REPLACE SIGNAL CABLE
YES
CHECK IC401 #21, 24, 26 PULSE
NO
YES
CHECK IC401 #23 DC LEVEL & #18, 19 PULSE
NO
YES
CHECK & REPLACE IC601, Q204
CHECK & REPLACE IC401
CHECK IC402 #1, 3, 5 PULSE
NO
YES
CHECK & REPLACE IC402
CHECK & REPLACE CRT SOCKET, G1

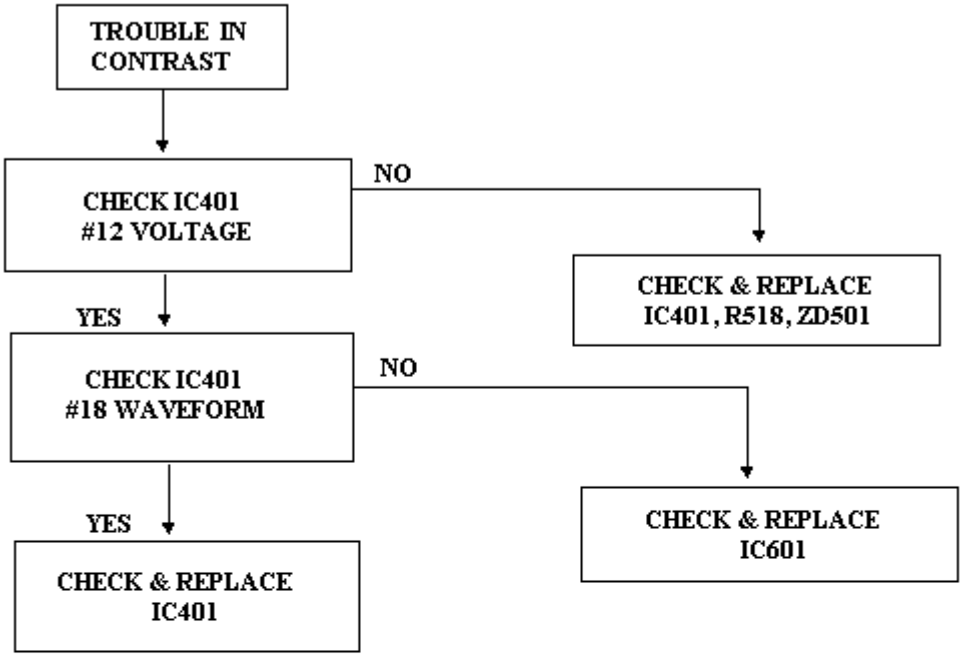
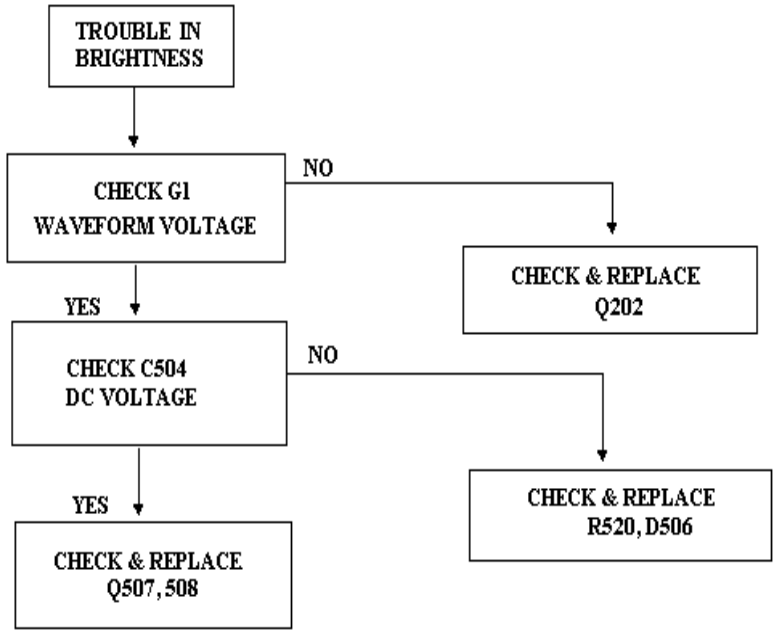
9-3. NO RASTER:


NO RASTER
CHECK HV & G2
NO
YES
CHECK Q308 WAVEFORM
YES
CHECK G1 DC - 80V
NO
NO
YES
CHECK & REPLACE Q507, 508, 509
CHECK L304 DC55V
YES
NO
CHECK & REPLACE Q313, 307, D315
CHECK & REPLACE FBT, CRT
CHECK & REPLACE D110

9-4 TROUBLE IN HORIZONTAL SIZE:



9-5. TROUBLE IN CONTRAST:



9-6. TROUBLE IN BRIGHTNESS: