

Table of Contents

1. Introduction.....	4
2. Operational Specification.....	5
2.1 Environment	5
2.1.1 Temperature.....	5
2.1.2 Humidity	5
2.1.3 Altitude	5
2.2 Transportation	5
2.2.1 Vibration Test	5
2.2.2 Drop Test (with packing, non-operating condition).....	5
2.3 Packing Configuration.....	6
2.3.1 Container Specification.....	6
2.3.2 Carton Specification	7
2.3.3 Pallet Specification	8
2.3.4 Container Carrying Capacity.....	8
2.4 Electrostatic Discharge Requirements	10
2.5 Safety Requirements	10
2.6 EMI Requirements	11
2.7 Reliability	11
2.8 Mechanical Design for TCO 99:.....	11
2.9 Environment Protection Design :.....	12
2.10 Acoustical Noise	12
3. Input / Output Signal Specification.....	12
3.1 Input Signal Requirements.....	12
3.1.1 Signal cable (Directly attached to unit)	12
3.1.2 Video signals:	13
3.1.3 Sync signal:	13
3.2 Function.....	13
3.2.1 Support timing	13
3.3 Number of display colors:	14
3.4 Adjustment function	14
3.5 Display Power Management System (DPMS).....	15
3.6 Plug & Play DDC1/2B Support.....	15
3.7 Power Supply Requirements.....	19
3.7.1 Input Power Requirements	19

Table of Contents

3.7.2 Output Power Requirements	20
3.7.3 AC Power Inlet	20
3.7.4 Input Power Cord	20
3.7.5 Power Management	20
3.8 Panel optical Characteristics.....	20
3.9 Panel Electrical Specifications	22
3.10 Defect, Scratch and Dust.....	22
4. Functional specification	23
4.1 Display Quality.....	23
4.1.1 Display Data Area (with full white pattern)	23
4.1.2 Video Performance.....	23
4.1.3 Light Output.....	23
4.1.4 Brightness Adjustment Range	23
4.2 Audio Quality(Optional).....	24
4.2.1 Preamp + Poweramp:.....	24
4.2.2 Speaker Driver:	24
4.2.3 Audio Controls:.....	24
4.3 USB pure hub (Optioal)	24
5. Physical Specifications	24
5.1 Physical Dimension & Appearance	24
5.1.1 Overall Dimensions:	24
5.1.2 Outer Appearance:	24
5.2 Construction and Materials on outer surface.....	24
5.3 Base	24
5.4 Marking & Labels	24
5.4.1 Reference Label (Rear panel)	24
5.4.2 Controls & Connectors	25
5.5 Packaging.....	25
5.5.1 Carton Dimension:.....	25
5.5.2 Shipping Weight:	25
5.5.3 Shipping Container:	25
6. Maintainability Specifications	25
6.1 General & Requirements	25
6.1.1 Installation:	25

Table of Contents

6.1.2 Periodic Maintenance:	25
6.1.3 Repair & Calibration:	25
6.2 Mean Time to Repair	25
6.2.1 Module Level	25
6.2.2 Component Level	25
6.3 Accessibility	25
6.3.1 General:	25
6.3.2 Outside Cabinet, access to the following elements.....	26
6.3.3 Cover Removal, Access	26
6.4 Equipment & Tools Required	26
6.4.1 Standard Test Equipment.....	26
6.4.2 Documentation	26
6.5 Electrical Emission and Energy Saving summary for TCO99.....	26
6.5.1 Electrical Field(AC):.....	26
6.5.2 Magnetic Field(AC):.....	26
6.5.3 Energy Saving:	26

1. Introduction

This specification describes a 17" analog color TFT LCD monitor. It can support maximum resolution 1280x1024 at 75Hz refresh rate. There are the following features:

- User controls:
 - (a) "Power on/off" switch.
 - (b) "Exit" key (Back to main OSD menu or leave OSD menu).
 - (c) "I-key"(Intelligent key for automatic adjustment function by pressing this button).
 - (d) "Enter" key (for enter OSD sub-menu or select items).
 - (e) "Fly Wheel"(for selecting adjustable items in left/right direction and increasing / decreasing the selected item by rotating it).
- OSD window for control and information display with 6 languages selection.
- DPMS (Display Power Management System)
- Power on/off indicator.
- High quality advanced zoom function (Scaling function)
- Swivel/Tilt base (with 300 degree swivel function and up/down tilt function from 0 to +25 degree).
- DDC1/2B function supported.
- Audio speakers supported.
- Optional USB hub supported (compliance with USB version 1.1)

It is composed of the following materials:

- A LCD monitor
 - (a) Head part:
 - (1) A LCD module (Samsung: LTM170E4-L01).
 - (2) An Inverter board.
 - (3) An AC-DC board(with audio circuit)
 - (4) An Interface board.
 - (5) A control board.
 - (6) An undetachable 15pin D-sub signal cable.
 - (7) Two speakers (optional).
 - (b) Base part:
 - Swivel/Tilt base.
 - A power cord.
 - A user menu.
 - Setup disk. (including .INF/.ICM/.CAT/Test pattern)
 - A Macintosh signal adapter.
 - An audio cable.
 - An 1 upstream port/2 downstream ports USB hub(optional).

2. Operational Specification

2.1 Environment

2.1.1 Temperature

- Operating 5 to +35°C
- Non-operating -20 to +60°C

2.1.2 Humidity

- Operating 20% to 80% at non-condensing and less than 39°C condition
- Non-operating 5% to 95% at non-condensing and less than 39°C condition

2.1.3 Altitude

- Operating (without packing condition) 0 to 3,657m (12,000ft)
- Non-operating (with packing condition) 0 to 12,192m (40,000ft)

2.2 Transportation

2.2.1 Vibration Test

2.2.1.1 Sinusoidal Vibration Test

Frequency (Hz): 2-200-2 Hz

Acceleration: 0.3 G

*Duration: 25 Minutes / Per Axis (X, Y, and Z Axis)

Acceleration: 0.5 G at resonant frequency

*Duration: 15 Minutes / Per Axis (X, Y, and Z Axis)

(Test passed criteria: After test, there is no electrical and mechanical damage.)

2.2.1.2 Random Vibration Test:

10 – 200 – 10Hz, 1.04Grms, 15 min, X, Y, Z Axis. Each one time.

Frequency (Hz)	G ² /Hz (PSD Level)
2.0	0.0010
4.0	0.0300
8.0	0.0300
40.0	0.0030
55.0	0.0100
.70.0	0.0100
200.0	0.0010

(Test passed criteria: After test, there is no electrical and mechanical damage.)

2.2.2 Drop Test (with packing, non-operating condition)

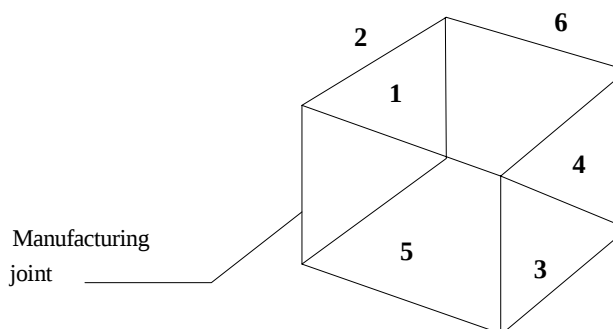
2.2.2.1 Drop Height: 88 cm.

2.2.2.2 Drop Sequence

Chapter 1 Engineering Specification

Surface number define:

- 1: Top
- 2: Front
- 3: Bottom
- 4: Rear
- 5: Left
- 6: Right



- Corner 5-3-2 select at weakness side [the low left(or right) corner of the front panel]
- An edge drop with impact on the shortest edge radiating from corner 5-3-2
- An edge drop with impact on the next shortest edge radiating from corner 5-3-2
- An edge drop with impact on the longest edge radiating from corner 5-3-2
- A flat drop with impact on the rear
- A flat drop with impact on the front
- A flat drop with impact on the right
- A flat drop with impact on the left
- A flat drop with impact on the bottom
- A flat drop with impact on the top

(Test passed criteria: After test, there is no electrical and mechanical damage.)

2.3 Packing Configuration

2.3.1 Container Specification

a. Shipping Container

Container Type		20'*8'*8'6" Steel	40'*8'*8'6" Steel	40'*8'*9'6" High Cube Steel
Weight (Unit: Kg)	Gross	24,000	30,480	30,480
	Tare	2,370	4,000	4,200
	Payload	21,630	26,480	26,280
Interior Measurement (Unit: mm)	Length	5,898	12,031	12,031
	Width	2,352	2,352	2,352

Chapter 1 Engineering Specification

	Height	2,394	2,394	2,699
Volume(Cubic Meter)		33.2	67.74	76.4
Door opening (Unit: mm)	Width	2,340	2,340	2,340
	Height	2,280	2,280	2,585
Useable Interior Dimension (Deducted pallet(110mm & Operating space 50mm))	Length	5,890	12,000	12,000
	Width	2,330	2,330	2,330
	Height	2,120	2,120	2,405

b. Air Transport

Container Type		Container (1)	Container (2)	Container (3)
		125"*96"*96"	125"*96"*118"	125"*88"*64"
Weight (Unit: Kg)	Gross	6,804	6,804	4,627
	Tare	129	129	129
	Payload	6,675	6,675	4,498
Interior Measurement (Unit: mm)	Length	3,048	3,048	3,048
	Width	2,260	2,260	2,082
	Height	2,438	2,997	1,625
Volume(Cubic Meter)		17	19	11

2.3.2 Carton Specification

Product Weight(Kgs)	Net	5.5
	Gross	7.6
Carton Interior Measurement(mm)	Length	450
	Width	426
	Height	211
Carton External Measurement(mm)	Length	482
	Width	446
	Height	231

Chapter 1 Engineering Specification

2.3.3 Pallet Specification

A. Dimension

Transport Type		Pallet A	Pallet B	Pallet C
Shipping Pallet Dimension (Unit: mm)	Length	676	X	X
	Width	1140	X	X
	Height	115	X	X
Air Transport Pallet Dimension (Unit: mm)	Length	676	676	X
	Width	1140	570	X
	Height	115	115	X

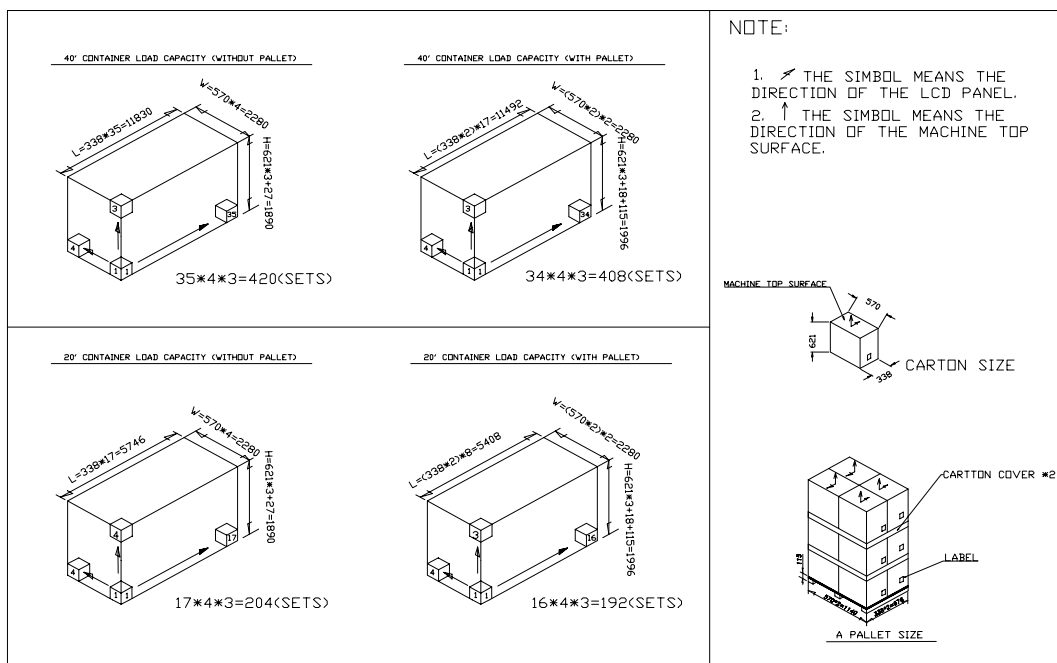
2.3.4 Container Carrying Capacity

A. Shipping Container

Stowing Type		Quantity of products (sets) (Every container)	Quantity of Products (sets) (Every Pallet)	Quantity of pallet (sets) (Every Container)
With pallet	20'	540	Pallet A: 6	Pallet A: 36
			Pallet B: 6	Pallet B: 54
	40'	1080	Pallet A: 12	Pallet A: 36
			Pallet B: 12	Pallet B: 54
without pallet	20'	600	X	X
			X	X
	40'	1200	X	X
			X	X

Chapter 1 Engineering Specification

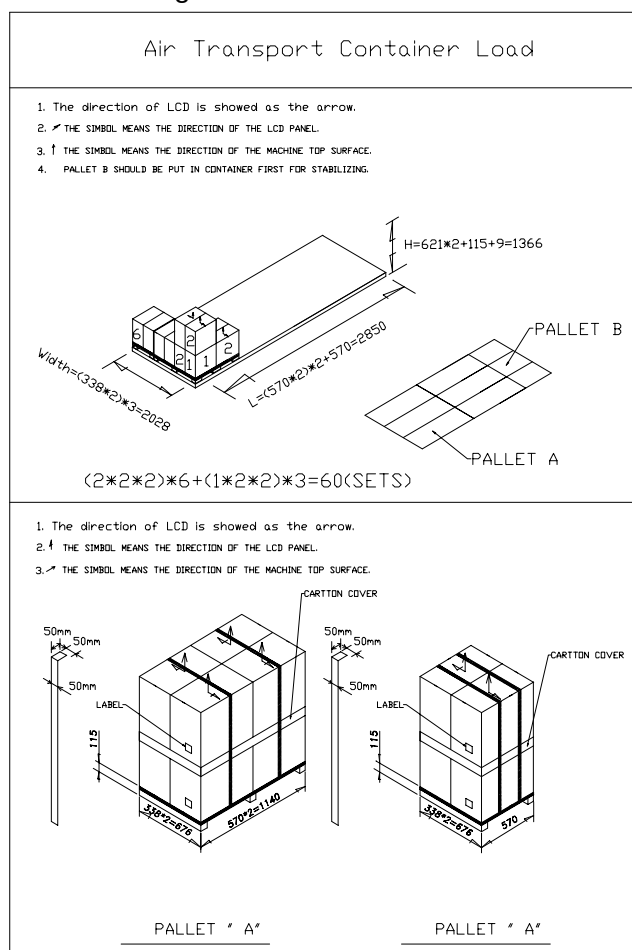
B. Shipping container Stowing Method



C. Air Transport Container

Container Type	Quantity of products (sets) (Every container)	Quantity of Products (sets) (Every Pallet)	Quantity of pallet (sets) (Every Container)
Container(3) 3048 * 2082 * 1625	60	Pallet A: 8	Pallet A: 6
		Pallet B: 4	Pallet B: 3
		Pallet C: X	Pallet C: X

D. Air Transport Container Stowing Method



2.4 Electrostatic Discharge Requirements

The subject product must withstand 4 KV for contact discharge and 8 KV for air discharge of Electrostatic Discharge and meet the acceptance criteria as specified in XXXISO 9241-3XXX -- should be IEC 801-2 .

2.5 Safety Requirements

The display unit complies with the following safety standards and specifications.

- UL compliance....standard for information-processing and business equipment, UL 1950.
- CSA compliance...standard C22.2 No. 950-M89, data processing equipment.
- TUV compliance...EN60950 safety specification-business equipment.
- ISO13406-2 .Ergonomic Requirements of Visual Display.
- Nemko...EN60950

2.6 EMI Requirements

1. This display unit complies with the following EMC rules and regulations.

- FCC compliance...FCC Rule, Part 15, Subpart B, Class B.
- VCCI compliance...VCCI Rule, Class-2.
- CE Mark Compliance... 89/336/EEC.
 - EN55022 Class B
 - EN61000-3-2
 - EN61000-3-3
 - EN55024
 - EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5
 - EN61000-4-6, EN61000-4-8, EN61000-4-11
- DNSF compliance...EN55022, Class B.
- MPR2 compliance & EN50279
- TCO99(option)

2. The sample for EMI agency approval should be under 3 dB of the limit.
The production pilot run units should be under 3 dB of the limit.
The mass production units should be under 1 dB of the limit.

2.7 Reliability

1. The prediction MTBF of display unit shall be greater than 40,000 hours excluding the lamp.(at 25 °C)
2. Lamp life time : 20,000 hrs minimum at which brightness of lamp is 50% compare to that of initial value at Ta=25+/-2°C and IL=13.0mA.

2.8 Mechanical Design for TCO 99:

1) Front Frame Reflectance:

- * diffuse reflectance: > 20%
- * Gloss <= 30% gloss unit

2) Labeling of plastics:

Plastic weight > 25g shall be marked in accordance with ISO11469

3) Variety of Plastic:

All plastic components that weight > 100g shall be made from the same type of plastic.

4) Painting of Plastic:

- * Any plastic components that weight >100g shall not be painted lacquer or vanished, so that the paint, lacquer or vanish in dry matter exceed 1 weight-% of the plastic component.
- * Mould decoration (IMD) is not allowed
- * All paints, lacquers, vanishes or colour additives used shall be declared by the type and mount.

5) Metallization of Plastic Housing:

- * Metallization is not allowed.

- 6) Plastic components > 25g shall not contain retardants of organically bound chloride or bromide.

2.9 Environment Protection Design :

Product is Per ES 715-c49 Environment Design Guide

2.10 Acoustical Noise

With the display operating, the issue of sound measured is contained within 40 dB/A in the audible field.

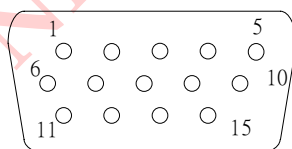
3. Input / Output Signal Specification

3.1 Input Signal Requirements

3.1.1 Signal cable (Directly attached to unit)

3.1.1.1 Video Inputs:

15pin D-sub connector is on the captive signal cable for IBM VGA, compatible graphic adapters. The pin assignment of this connector is described as below:



15-pin D-sub female

- 1 RED VIDEO
- 2 GREEN VIDEO
- 3 BLUE VIDEO
- 4 GROUND
- 5 GROUND
- 6 RED GROUND
- 7 GREEN GROUND
- 8 BLUE GROUND
- 9 PC5V
- 10 SYNC GROUND
- 11 GROUND
- 12 SDA
- 13 H SYNC (H+V)
- 14 V SYNC
- 15 SCL

3.1.1.2 Cable length:

1500mm +/- 20mm

Chapter 1 Engineering Specification

3.1.2 Video signals:

RGB separate, Analog 0.7Vp-p/75 Ohm

3.1.3 Sync signal:

- H/V separate , TTL level
- H/V composite ,TTL level

3.2 Function

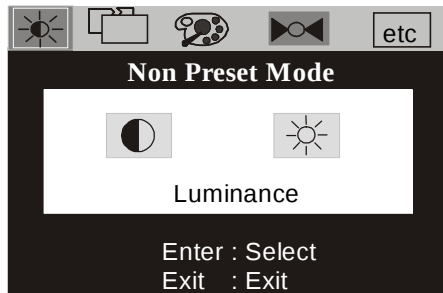
3.2.1 Support timing

This Interface board is designed to operate in any of the following video mode.

Incoming display mode(Input timing)					Multi-scan operation
Resolution	Horizontal Frequency (KHz)	Vertical Frequency (Hz)	Dot Clock Frequency (MHz)	Remark	Actual display resolution
640x350	31.47(P)	70.08(N)	25.17	DOS	full screen 1280x1024
*720x400	31.47(N)	70.08(P)	28.32	DOS	
640x480	31.47(N)	60.00(N)	25.18	DOS	
640x480	35.00(N)	67.00(N)	30.24	Macintosh	
640x480	37.86(N)	72.80(N)	31.5	VESA	
640x480	37.50(N)	75.00(N)	31.5	VESA	
800x600	37.88(P)	60.32(P)	40.00	VESA	
800x600	48.08(P)	72.19(P)	50.00	VESA	
*800x600	46.86(P)	75.00(P)	49.50	VESA	
832X624	49.72(N)	74.55(N)	57.29	Macintosh	
*1024x768	48.36(N)	60.00(N)	65.00	VESA	
1024x768	56.48(N)	70.10(N)	75.00	VESA	
*1024x768	60.02(P)	75.00(P)	78.75	VESA	
1024X768	60.24(N)	74.93(N)	80.00	Macintosh	
1152x864	67.50(P)	75.00(P)	108.00	VESA	
*1152x870	68.68(N)	75.06(N)	100.00	Macintosh	
1152x900	61.80(N)	66.00(N)	94.50	SUN 66	
1152x900	71.81(N)	76.14(N)	108.00	SUN	
*1280x1024	64.00(P)	60.00(P)	108.00	VESA	
1280x1024	75.83(N)	71.53(N)	128.00	IBM1	
*1280x1024	80.00(P)	75.00(P)	135.00	VESA	
*1280x1024	81.18(N)	76.16(N)	135.09	SPARC2	
*1280x960	60.00(P)	60.00(P)	108.00	VESA	1280x960
*1280x960	75.00(P)	75.00(P)	129.60	VESA	

Notes (1) The timings with "*"symbol will be adjusted in the factory.

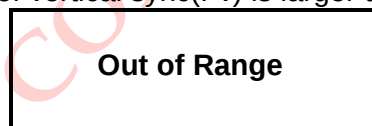
- (2) If the incoming display mode is not supported by this I/F board listed above, the up side of OSD window will show "Non Preset Mode" as below to indicate it. Maybe the picture can show up or doesn't which is unpredictable, even the picture can display but probably isn't good or clear.



- (3) Some signals from graphics board may not function properly.
- (4) "P", "N" stands for "Positive", "Negative" polarity of incoming HSYNC/VSNC(input timing).
- (5) OSD will show "No Signal" message on the screen as below to indicate it while no display mode inputs,



- (6) OSD will show "Out of Range" message on the screen as below to indicate it while input display mode meet the following condition,
- (a) The resolution is larger than 1280x1024.
 - (b) The resolution is 1280x1024 but its frequency of vertical sync(Fv) is larger than 77Hz.
 - (c) The frequency of horizontal sync(Fh) is larger than 90KHz.
 - (d) The frequency of vertical sync(Fv) is larger than 110Hz.



3.3 Number of display colors:

16M color numbers

3.4 Adjustment function

(A) **Hot key function:** Contrast, Brightness & Speaker Volume(optional) adjustment.

(B) **Main OSD menu:**

- 1.) **Luminance:** Contrast and Brightness adjustment.
- 2.) **Geometry:** Horizontal Position, Vertical Position, Phase and Pixel Clock adjustment.
- 3.) **Color Adjustment:** Recall preset R,G,B color, Red, Green and Blue adjustment.
- 4.) **Input signal information:** Recall preset geometric values.
- 5.) **Miscellaneous:** OSD Position adjustment, Zoom(on/off) and Language Selection.

3.5 Display Power Management System (DPMS)

This Interface board will automatically cut down the power of the monitor when not receiving HSYNC or VSYNC signals over about 5 seconds, and the condition are as below,

HSYNC	VSYNC	LCD Module	Backlight
Pulse	pulse	on	on
no pulse	pulse	off	off
Pulse	no pulse	off	off
no pulse	no pulse	off	off

3.6 Plug & Play DDC1/2B Support

When the DDC function is supported, it is necessary to input all EDID data(128 bytes) by using SCL and SDA signal, the DDC data table is as below:

Address	Data	Description
00	00	Header
01	FF	
02	FF	
03	FF	
04	FF	
05	FF	
06	FF	
07	00	
08	38	ID Manufacturer Name = NEC
09	A3	
0A	B5	ID Product Code = LCD1700M+
0B	65	(Vender Assigned code)
0C	01	Not used
0D	01	
0E	01	
0F	01	
10	*	Week of Manufacture (0-53),use 0 if n/a
11	*	Year of Manufacture (year – 1990)
12	01	EDID version
13	03	Revision
14	6C	Video Input Define
15	22	Max. H. Image Size (cm) = 33.79 cm
16	1B	Max. V. Image Size (cm) = 27.03 cm
17	78	(gamma*100) – 100

Chapter 1 Engineering Specification

Address	Data	Description
18	EA	DPMS
19	6E	Red Green Bits Rx1Rx0Ry1Ry0Gx1Gx0Gy1Gy0
1A	87	Blue White Bits Bx1Bx0By1By0Wx1Wx0Wy1Wy0
1B	A2	Red x bit9-2 (Red_x = 0.634)
1C	5A	Red y bit9-2 (Red_y = 0.354)
1D	4D	Green x bit9-2 (Green_x = 0.304)
1E	94	Green y bits9-2 (Green_y = 0.581)
1F	24	Blue x bit9-2 (Blue_x = 0.143)
20	1A	Blue y bit9-2 (Blue_y = 0.102)
21	51	White x bit9-2 (White_x = 0.318)
22	56	White y bit9-2 (White_y = 0.339)
23	BD	Established Timing I
24	EF	Established Timing II
25	80	Established Timing III
26	71	Standard Timing Identification
27	4F	#1 1152X864 75HZ
28	81	#2
29	80	1280X1024 60HZ
2A	81	#3
2B	8C	
2C	81	#4
2D	90	
2E	81	#5
2F	40	
30	01	#6
31	01	
32	01	#7
33	01	
34	01	#8
35	01	
36	30	Detailed Timing Description # 1 = 1280 X 1024 @ 60HZ LSB value of "Pixel clock/10,000" (Pixel clock=108MHz)
37	2A	MSB value of "Pixel clock/10,000" (Pixel clock=108MHz)
38	00	Horizontal Active(Pixels, lower 8 bits) = 1280(D) = 0500(H)
39	98	Horizontal Blanking(Pixels, lower 8 bits) = 408(D) = 0198(H)

Chapter 1 Engineering Specification

Address	Data	Description
3A	51	Horizontal Active(upper 4 bits): Horizontal Blanking(upper 4 bits)
3B	00	Vertical Active(Lines, lower 8 bits) = = 1024(D) = 0400(H)
3C	2A	Vertical Blanking(Lines, lower 8 bits) == 42(D) = 002A(H)
3D	40	Vertical Active(upper 4 bits): Vertical Blanking(upper 4 bits)
3E	30	H.Sync. Offset(Pixels, H. Front Porch, lower 8 bits)==48(D)=0030(H)
3F	70	Horizontal Sync Pulse Width(Pixels, lower 8 bits)==112(D)=0070(H)
40	13	Vertical Sync Offset(upper 4 bits):Vertical Sync Pulse Width(upper 4 bits)
41	00	H. Sync Offset(bit 7,6), H. Sync Pulse Width(bit 5,4), V. Sync Offset(bit 3,2), C. Sync Pulse Width(bit 1,0)
42	52	Horizontal Image Size(mm, lower 8 bits) = = 359(D) = 167(H)
43	0E	Vertical Image Size(mm, lower 8 bits) == 287(D) = 11F(H)
44	11	Horizontal Image Size(upper 4 bits) & Vertical Image Size(upper 4 bits)
45	00	Horizontal Border(Pixels) = 0
46	00	Vertical Border(Lines) = 0
47	1E	Non-interlaced, no stereo, Digital separate, H,V-Polarity=(+,+)
48	00	Flag=00h when block used as descriptor
49	00	Flag=00h when block used as descriptor
4A	00	Reserved when block(address 48~59) is defined as descriptor
4B	FD	Set this block as “ Monitor Range Limits ” descriptor
4C	00	Flag=00h when block used as descriptor
4D	38	Min. Vertical rate(Hz) = 56(Hz)
4E	4B	Max. Vertical rate(Hz) = 75(Hz)
4F	1F	Min. Horizontal rate(kHz) = 31(kHz)
50	51	Max. Horizontal rate(kHz) = 81(kHz)
51	0E	Max. Supported Pixel Clock(MHz) = 140(MHz)
52	0A	No secondary timing formula supported
53	20	(unused)
54	20	(unused)
55	20	(unused)
56	20	(unused)
57	20	(unused)
58	20	(unused)
59	20	(unused)

Chapter 1 Engineering Specification

Address	Data	Description
5A	00	Flag=00h when block used as descriptor
5B	00	Flag=00h when block used as descriptor
5C	00	Reserved when block(address 5A~6B) is defined as descriptor
5D	FC	Set this block as “ Monitor Name ” descriptor
5E	00	Flag=00h when block used as descriptor
5F	4E	1st character = N
60	45	2nd character = E
61	43	3rd character = C
62	20	4th character = <space>
63	4C	5th character = L
64	43	6th character = C
65	44	7th character = D
66	31	8th character = 1
67	37	9th character = 7
68	30	10th character = 0
69	30	11th character = 0
6A	4D	12th character = M
6B	2B	13th character = +
6C	00	Flag=00h when block used as descriptor
6D	00	Flag=00h when block used as descriptor
6E	00	Reserved when block(address 6C~7D) is defined as descriptor
6F	FF	Set this block as “ Monitor Serial Number ” descriptor
70	00	Flag=00h when block used as descriptor
71	*	(Varies)
72	*	(Varies)
73	*	(Varies)
74	*	(Varies)
75	*	(Varies)
76	*	(Varies)
77	*	(Varies)
78	*	(Varies)
79	*	(Varies)
7A	0A	(unused)
7B	20	(unused)
7C	20	(unused)

Address	Data	Description
7D	20	(unused)
7E	00	Extension Flag
7F	*	Check sum

3.7 Power Supply Requirements

3.7.1 Input Power Requirements

- (1) Input Voltage Range
The unit shall meet all the operating requirements with an input voltage range of 90~264 Vac .
- (2) Input Current
Maximum
Input Current Measuring Range
(MAX) 2 Arms 90Vac ~ 264Vac
- (3) Frequency Range
The unit shall operate within a frequency range of 47Hz to 63Hz.
- (4) Inrush Current
Power supply inrush current shall be less than the ratings of its critical components (including Power switch, fuse, rectifiers and surge limiting device) for all conditions of line voltage.
- (5) Regulator Efficiency
70% minimum (measuring at 115Vac and full load)
- (6) Power line Transient Immunity
The power supply shall function properly after being subjected to a 8us/20us, 2000 volts (gnd to line), 1.2us/50us(line to line) or 5ns/50ns,1000 volts fast peak pulse applied either differentially or single end to line and neutral at any phase of the power line voltage and shall not cause an unsafe or unrecoverable errors.
- (7) Maximum power consumption < 45 Watts (without USB hub & without audio).
Maximum power consumption < 54 Watts (without USB hub & with audio).
Maximum power consumption < 53 Watts (with USB hub & without audio)
Maximum power consumption < 62 Watts (with USB hub & with audio)

Power saving mode < 3 Watts (without USB hub)
- (8) Safety concern: 1. Earth leakage current < 3.5mA at 264Vac(< 0.5mA at 100VAC)
2. Electric strength<10mA
3. Primary-Secondary: 4242(DC).
4. Primary-Earth: 2121(DC)

3.7.2 Output Power Requirements

The power circuit shall supply DC power outputs as followings:

Output	Nominal	Regulation	Load Current Range
1	12V	±10%	0 ~ 3.0A
2	5V-Fix	±3%	0 ~ 1.2A
3	5V	±3%	0 ~ 500mA
4	3.3V	±3%	0 ~ 1A

3.7.3 AC Power Inlet

The display unit shall be supplied with an AC power INALWAYS 0174(or equivalent), to be located at the rear of the LCD Monitor.

3.7.4 Input Power Cord

Each AC adapter unit shall be supplied with a input power cord, with length of 1800mm king cord KC-003 or equivalent.

3.7.5 Power Management

Mode	H/Vsync	Power consumption	LED Color (Status)	Recovery Time
Normal	Both exist	< 45W (without USB hub)	Green (Normal)	--
off	None or only one exist	< 3W (without USB hub)	Amber	3 sec

3.8 Panel optical Characteristics

SAMSUNG LT170E2-132 optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0° and aperture 1 degree. The test equipment is BM-7. The input signal voltage and timing specification are V_{DD} of 5V, 60Hz of Fv and 54MHz of pixel rate respectively. The input current of backlight is 13mArms.

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Contrast Ratio	CR	250	350	-		1
Luminance of White(center of screen)	YL	170	200	-	cd/m ²	2
Brightness Uniformity	Buni	-	-	25	%	3
Response Time	Tr		35	40	msec	
	TR	-	20	20		
	TF	-	15	20		
CIE Color Coordinates						
	Red	X _R	0.604	0.634	0.664	
		y _R	0.324	0.354	0.384	
	Green	X _G	0.274	0.304	0.334	
		y _G	0.551	0.581	0.611	
	Blue	X _B	0.113	0.143	0.173	
		y _B	0.078	0.102	0.132	

Chapter 1 Engineering Specification

White	x_w	0.288	0.318	0.348		
	y_w	0.309	0.339	0.369		
Viewing Angle by CR ≥ 10					degree,	4
x axis, right ($\Phi=0^\circ$)	θ	70	80	-		
x axis, left ($\Phi=180^\circ$)	θ	70	80	-		
y axis, up ($\Phi=90^\circ$)	θ	70	80	-		
y axis, down ($\Phi=270^\circ$)	θ	70	80	-		

OPTICAL CHARACTERISTICS

Notes 1. Contrast Ratio (CR) is defined mathematically as:

(Surface Brightness with all white pixels)

(Surface Brightness with all black pixels)

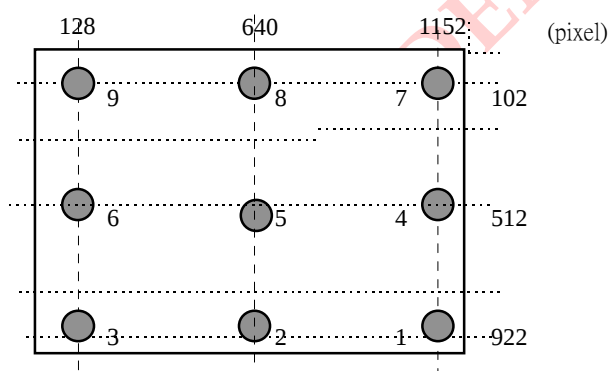
Contrast ratio shall be measured at the center of the screen (Location 5).

2. Luminance of White is brightness value at location 5(refer to note 3) at center of the screen.

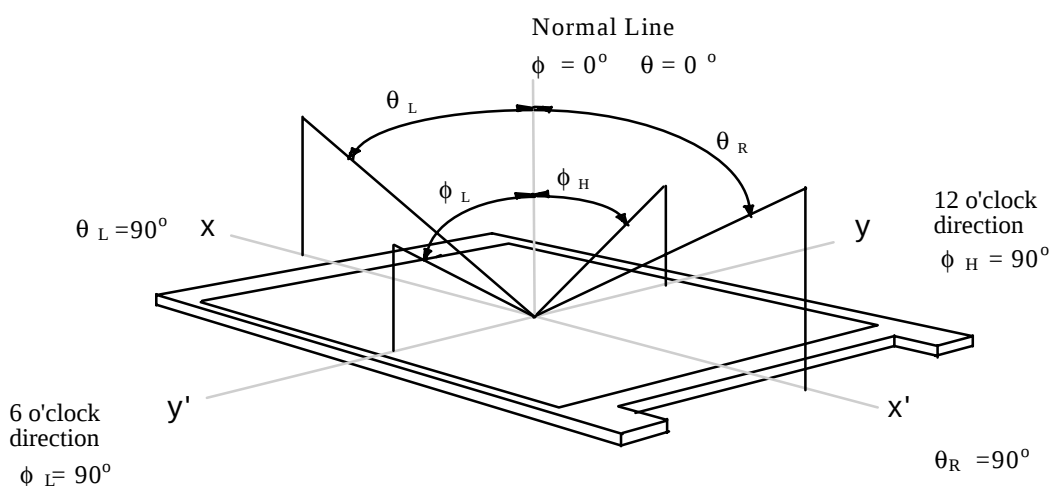
3. The 9 points brightness uniformity, Buni is defined as :

$$\frac{|\text{Maximum } (B_1, B_2, \dots, B_9) - \text{Minimum } (B_1, B_2, \dots, B_9)|}{\text{Maximum } (B_1, B_2, \dots, B_9)} \times 100(\%)$$

Where B1 to B9 are the brightness with all pixels displaying white at 9 locations.



4. Viewing angle is the angle at which the contrast ratio is greater than 10.



3.9 Panel Electrical Specifications

The SAMSUNG LTM170E4-L01 requires two power inputs. One input is employed to power the LCD electronics and to drive the voltages to drive the TFT array and liquid crystal. And the second input for the backlight CCFL, is typically generated by an inverter. The inverter is an external unit to the LCD.

Table 2 ELECTRICAL CHARACTERISTICS:

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Lamp Current	IL	2.0	6.5	7.0	mArms	
Lamp Voltage	VL	-	690	-	Vrms	
Lamp Frequency	fL	30	-	80	KHz	1
Operating Life Time	Hr	20,000	-	-	Hour	2
Startup Voltage	Vs	-	-	1100(25°C) 1420(0°C)	Vrms	3

- Notes:
1. Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.
 2. Life time (Hr) of a lamp is defined as the time in which it continues to operate under the condition of $T_a = 25 \pm 2^\circ\text{C}$ and $IL = 6.5\text{mArms}$ for one lamp until the brightness becomes 50% or lower than its original value.
 3. If an inverter has shutdown function it should keep its output for more than 1 second even if the lamp connector open. Otherwise the lamps may not to be turned on.

3.10 Defect, Scratch and Dust

Defect Type	Accept	Reject
Bright dot		
Random	$N \leq 6$	$N > 6$
Two adjacent (Horizontal)	$N \leq 1$	$N > 1$
(Vertical)	$N \leq 1$	$N > 1$
Three adjacent	Not allowed	Not allowed
Four or more adjacent		
Dark dot,		
Random	$N \leq 6$	$N > 6$
Two adjacent (Horizontal)		
(Vertical)	$N \leq 2$	$N > 2$

Chapter 1 Engineering Specification

Three adjacent (Horizontal)	N ≤ 1	N > 1
Three adjacent (Vertical)	N ≤ 0	N > 0
	Not allowed	Not allowed
Maximum allowable number of dot defect	N ≤ 6	N > 6
Minimum distance between defects,		
Bright dot –to-bright dot	L ≥ 15 mm	L < 15 mm
Dark dot – to – dark dot	L ≥ 5mm	L < 5mm
White spot		
R.G.B, Black, white	D ≤ 0.8 mm	D > 0.8 mm
Gray pattern (128 gray)	D ≤ 0.5 mm	D > 0.5 mm

4. Functional specification

All the tests to verify specifications in this section must be performed under the following standard conditions unless otherwise noted. The standard conditions are:

- Temperature: 5 to 35 degree Celsius
- AC line input voltage: 100 Vac to 240 Vac, 50Hz or 60Hz
- Warm-up time: 30 minutes minimum

4.1 Display Quality

4.1.1 Display Data Area (with full white pattern)

- (1) Horizontal: 337.9 +/- 0.5 mm
- (2) Vertical: 270.3 +/- 0.5 mm

4.1.2 Video Performance

- (1) Resolution: 1280 X 1024 pixels Maximum
- (2) Contrast ratio: 250(Min.)
- (3) Response time: 35 mS (Typ.)
- (4) Viewing angle : U/D:70° R/L:70° (Min.) (At contrast ratio ≥ 10)
- (5) CIE Coordinate: White (0.318, 0.339) +/- (0.03, 0.03)
- (6) Display color: 16.7M

4.1.3 Light Output

Brightness rating : 200cd/m² (Typ.) (usre mode color temp.)

4.1.4 Brightness Adjustment Range

At contrast ratio control set at maximum level, adjusting Brightness control from minimum to maximum position, the light output of WHITE pattern shall be increased more than 40cd/m².

4.2 Audio Quality(Optional)

4.2.1 Preamp + Poweramp:

- (1) Output Power: 1.0 W rms/CH @ 1KHz
- (2) THD (@ 1W): <1%
- (3) S/N ratio: 50db

4.2.2 Speaker Driver:

- (1) Nominal Impedance: 8 Ohm
- (2) Maximum Input Power: 2W/CH
- (3) Frequency Response: 12KHz
- (4) Size: 30*70 mm
- (5) Magnetic Shield: Required

4.2.3 Audio Controls:

- (1)Volume 0-99 Levels

4.3 USB pure hub (Optional)

- (1) Use ISP1122 (Philips stand-alone USB hub device) solution.
- (2) Compliance with "USB Specification Rev. 1.1:.
- (3) Support 1 upstream port and 2 downstream ports.
- (4) USB power: DC 5V (+/- 0.5V), 1A (+/- 0.1A)

5. Physical Specifications

5.1 Physical Dimension & Appearance

5.1.1 Overall Dimensions:

422mm (W) X 451mm (H) X 207.97mm (D)

5.1.2 Outer Appearance:

see Fig.1

5.2 Construction and Materials on outer surface

- (1) Materials: Plastic
- (2) Color: WHITE
- To be defined for OEM

5.3 Base

- (1) Tilt: 0/+25 °
- (2) Swivel: ± 150°

5.4 Marking & Labels

5.4.1 Reference Label (Rear panel)

- (1) Reference numbers
- (2) Manufacture data

- (3) Agency Approvals
- (4) Power Ratings

5.4.2 Controls & Connectors

- (1) AC power cord input: abbreviated labels
- (2) User's Controls: standard print

5.5 Packaging

5.5.1 Carton Dimension:

570mm (W) X 338mm (D) X 621mm (H) (LCD monitor)

5.5.2 Shipping Weight:

10kg (LCD monitor)

5.5.3 Shipping Container:

420 sets per 40 feet container without pallet.

6. Maintainability Specifications

6.1 General & Requirements

6.1.1 Installation:

From outside of unit with standard tools and documentation provided to user.

6.1.2 Periodic Maintenance:

No periodic maintenance is required.

6.1.3 Repair & Calibration:

Require spare modules or components as specified as followings:

- (1) Interface board ASSY
- (2) AC-DC converter board ASSY
- (3) Control board ASSY
- (4) USB board ASSY (optional)

6.2 Mean Time to Repair

6.2.1 Module Level

Less than 10 minutes

6.2.2 Component Level

Less than 15 minutes

6.3 Accessibility

6.3.1 General:

All panels, covers, and major assemblies are removable without disruption of permanent mounting or fasteners.

6.3.2 Outside Cabinet, access to the following elements

- Operating Controls
- AC Inlet
- Audio in
- DC Jack for USB hub (optional)

6.3.3 Cover Removal, Access

All sub assemblies and internally adjustable components may be accessed by removing the base and the rear cover.

6.4 Equipment & Tools Required

6.4.1 Standard Test Equipment

- (1) Voltmeter
- (2) Dual trace oscilloscope
- (3) Hand tools as required
- (4) Computer with IBM VGA , or compatible graphic adapter

6.4.2 Documentation

A service manual will be available which covers all service requirements. A users manual written in Japanese German, Italian, Spanish, France and English will be available to ship with the product.

6.5 Electrical Emission and Energy Saving summary for TCO99

6.5.1 Electrical Field(AC):

*Band I < 10V/m (132cd/m², "+" pattern)

*Band II < 1V/m (132cd/m², "+" pattern)

Note: Shielded power cord is not acceptable

6.5.2 Magnetic Field(AC):

*Band I < 200nt (132cd/m², "+" pattern)

*Band II < 32nt (132cd/m², "+" pattern)

Note: Shielded power cord is not acceptable

6.5.3 Energy Saving:

*1st stage: <15W (recover time: 3 sec)

2nd stage: <5W

*single stage:<5W (recover time: 3sec)

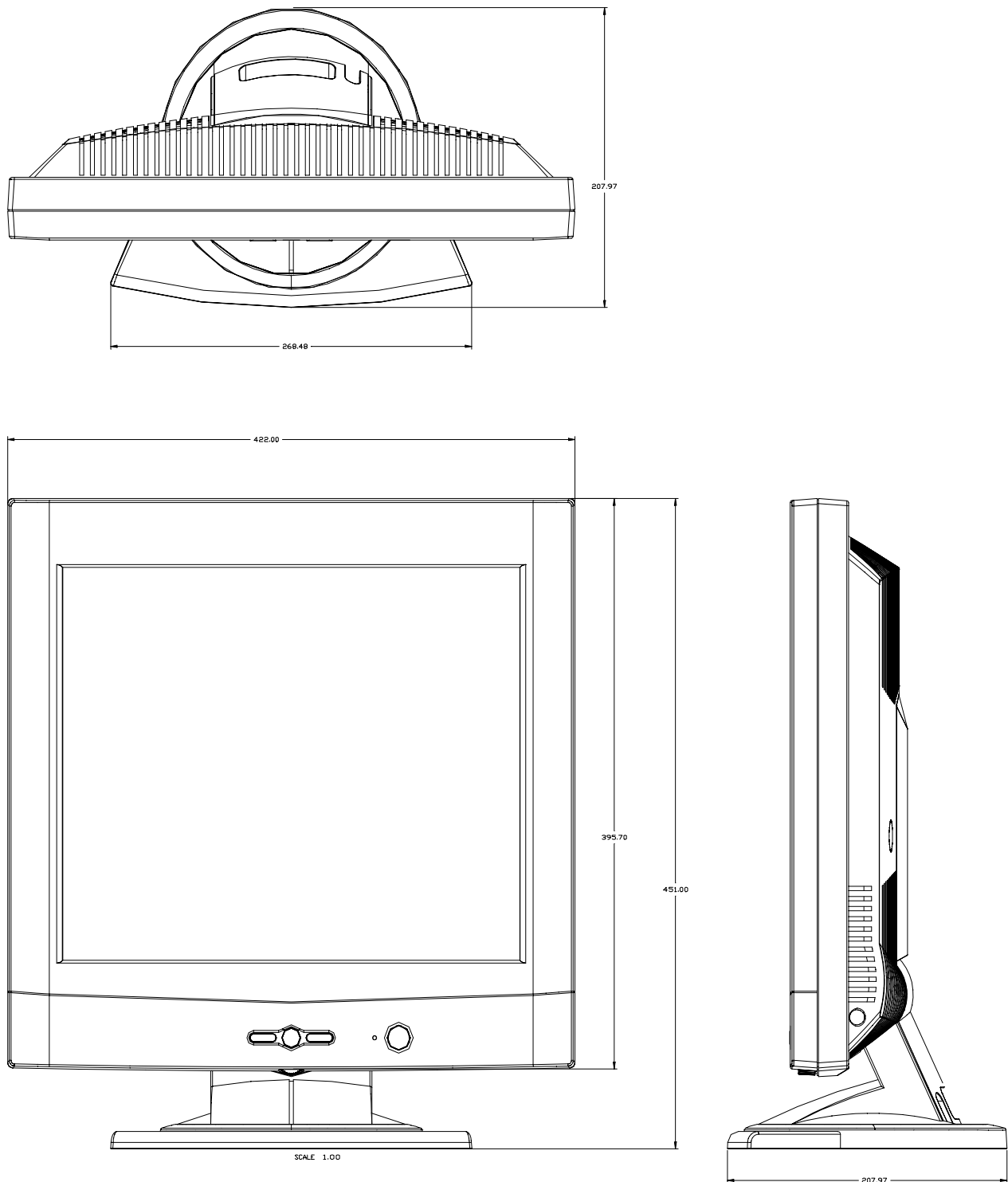


Fig. 1 Physical Dimension Top View, Front View and Side view

Table of Contents

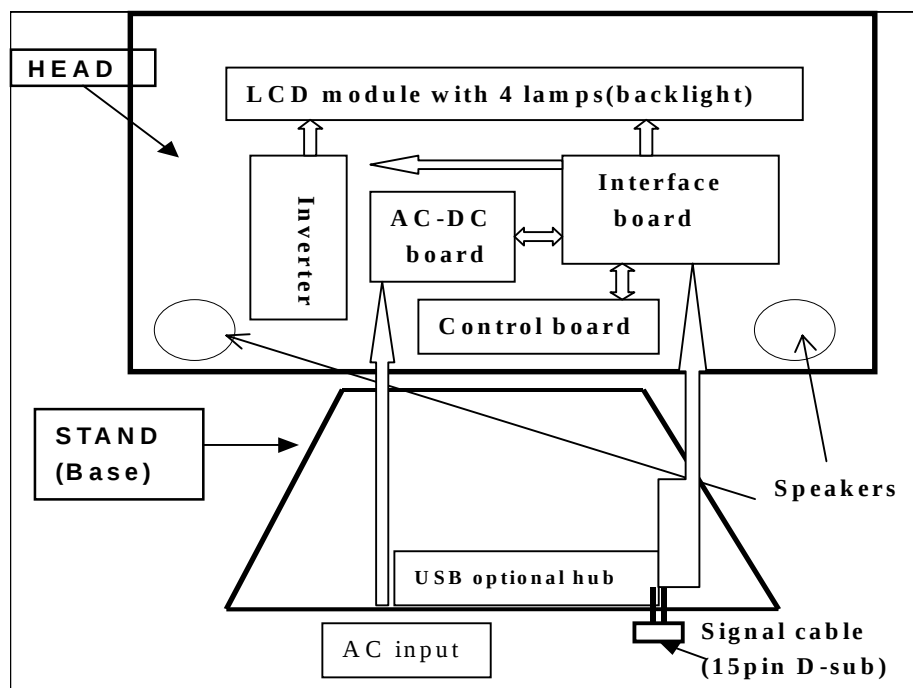
1. Introduction.....	2
2. Block diagram.....	2
3. Circuit operation theory	3
A. HEAD	3
A-1.) Interface board diagram.....	3
(a) Circuit operation theory:	3
(b) IC introduction:.....	3
A-2.) AC-DC board diagram:	4
EMI Filter.....	5
Rectifier and filter	5
Switching element and Isolation power transformer	6
Rectifier and filter	6
Control circuit	7
Feedback circuit	7

1. Introduction

The 1700M+ is a 17" SXGA (1280x1024) 24 bits color TFT LCD monitor with multi-media function and an optional USB hub. It's an analog interface LCD monitor with a non-detachable 15 pins D-sub signal cable and it's compliant with VESA specification to offer a smart power management and power saving function. It also offers OSD menu for users to control the adjustable items and get some information about this monitor, and the best function is to offer users an easy method to set all adjustable items well just by pressing one key, we called it "Auto-key" (intelligent key) which can auto adjusting all controlled items.

2. Block diagram

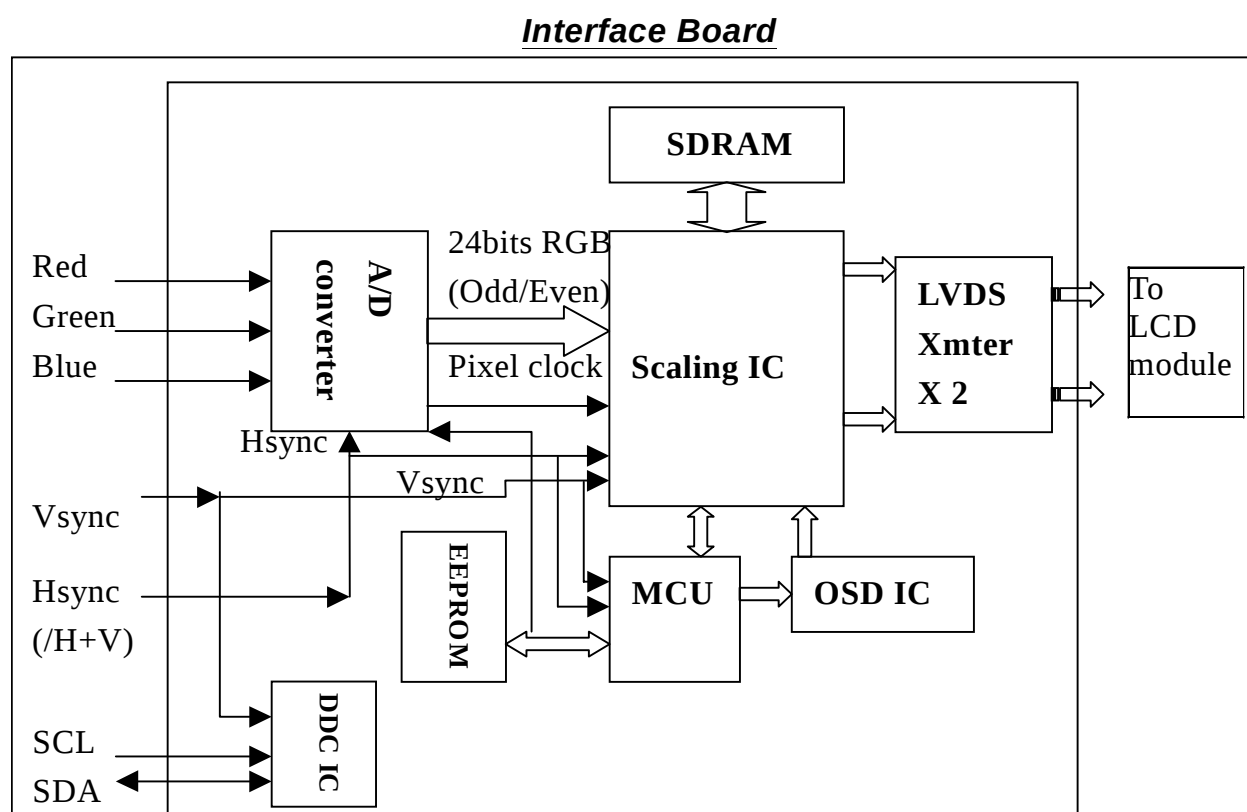
The 1700M+ consists of a head and a stand (base). The head consists of a LCD module with 4 lamps, an Inverter, an interface board, a AC-DC board, a control board and two speakers. The stand consists of an optional USB hub. The block diagram is shown as below.



3. Circuit operation theory

A. HEAD

A-1.) Interface board diagram



(a) Circuit operation theory:

A basic operation theory for this interface board is to convert analog signals of Red, Green and Blue to digital signals of Red, Green and Blue, and by the internal PLL circuit of A/D converter to generate the pixel clock to output to the scaling IC, then the scaling IC use the SDRAM to be the frame buffer to process the different input signals which are operating in the specification of the A/D converter and the scaling IC, finally the scaling IC output the digital RGB data, the fixed frequency of Hsync, Vsync and pixel clock to LCD panel driver IC by LVDS transmitter.

(b) IC introduction:

- 1.) DDC(Display Data Channel) IC: We use ATMEL 24C21 to support DDC1/2B function, it will store the information related to LCD monitor and PC can read them by “Vsync and SDA” serial communication for DDC1 or I² C communication for DDC2B.

Chapter 2 Circuit Operation Theory

- 2.) A/D converter: We use AD9884 of ADI which can support maximum 140MHz pixel rate to convert analog signals of RGB to 24bits digital RGB signals and generate a pixel clock signal by Hsync and its internal PLL circuit, then transmit these digital signals to Scaling IC.
- 3.) Scaling IC: We use MX88L282 of Macronix and by its frame buffer function to process the digital RGB signals to maximum 75Hz refresh rate at 1280 by 1024 resolution (about 135MHz pixel rate), it also support a ratio expansion function to display a full screen when the resolution of input signals are less than 1280 by 1024.
- 4.) SDRAM: We use 3 pieces of 2M bytes SDRAM to be the frame buffer of the scaling IC to process maximum 1280 by 1024 resolution of 24 bits RGB data.
- 5.) MCU: We use Myson MTV112V to controls all the functions of this interface board, just like the mode detecting, OSD display setting, the adjustable items, adjusted data storage, DPMS control, the external RS232 communication and the scaling IC.
- 6.) EEPROM: We use 24C04 to store all the adjustable data, and we divide it into two parts for the storage of factory settings and user settings.
- 7.) OSD IC: We use LSC3852 of Motorola to do "On Screen Display" function.
- 8.) LVDS transmitter IC: We use two THC63LVDM83A LVDS transmitter of Thine to transmit the digital data from the interface board to the LCD panel's driver IC, which has a built-in LVDS receiver IC.

A-2.) AC-DC board diagram:

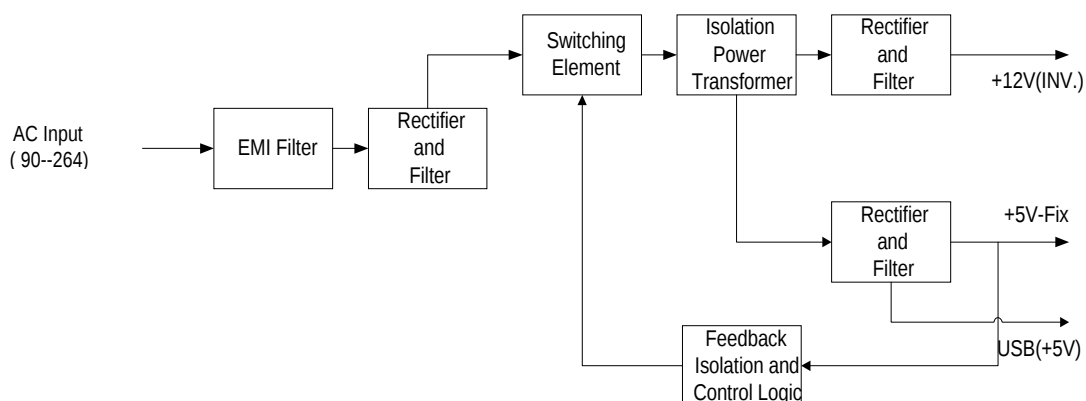


Fig. 1

EMI Filter

This circuit (fig. 2) is designed to inhibit electric and magnetic interference for Meet FCC, VDE, VCCI standard requirements.

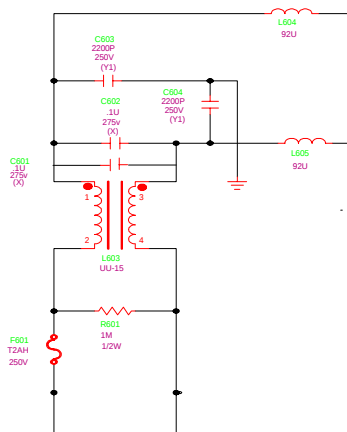


Fig. 2

Rectifier and filter

AC Voltage (90-264V) is rectified and filtered by BD601, C605 (See Fig 3) and the DC Output voltage is $1.4 \times (\text{AC input})$. (See Fig.3)

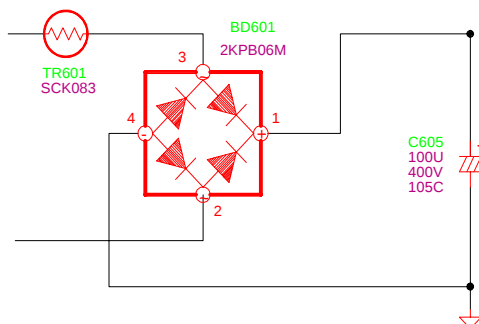


Fig. 3

Switching element and Isolation power transformer

When the Q601 turns on, energy is stored in the transformer. During Q601 OFF period, the stored energy is delivered to the secondary of transformer. R604, C606 and D601 is a snubber circuit. R605 is current sense resistor to control output power. (See Fig.4)

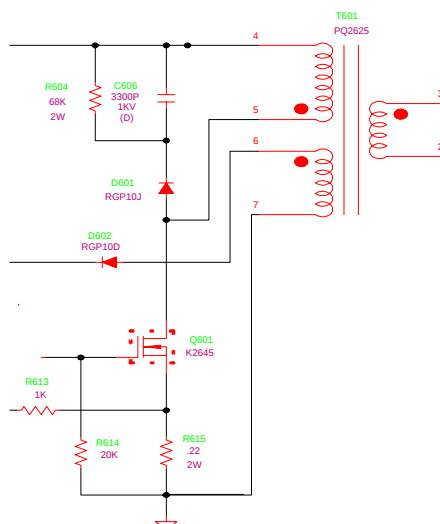


Fig. 4

Rectifier and filter

D701 and C701 are to produce DC output. L701 and C702 are to suppress high Frequency switching spikes. R702 is a dummy load. (See Fig.5)

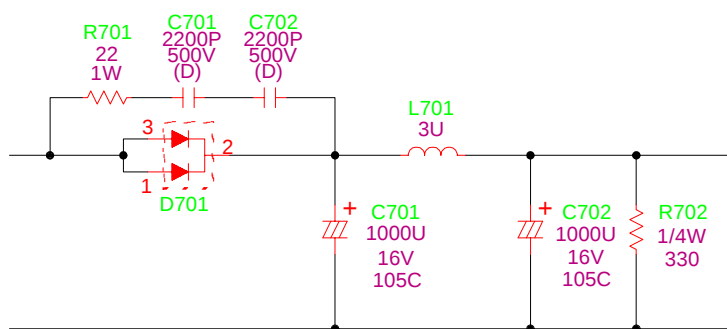


Fig. 5

Control circuit

The current mode control IC UC3843A is used to control PWM. When the VCC terminal of it gets 8.4V, IC601 turns on. +5V will be set up at Pin8 through soft start circuit includes R617, C611, D606 and D605. R616 and C610 generate a fixed frequency sawtooth wave at Pin4.

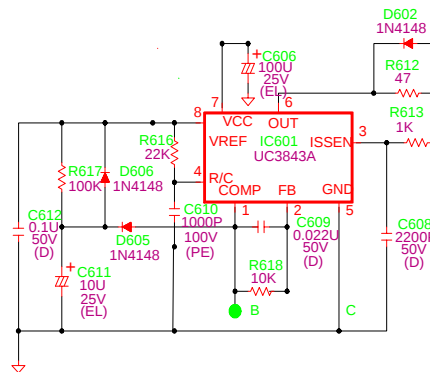


Fig. 6

Feedback circuit

TLP721F is a optocoupler and TL431 is a shunt regulation. They are used to detect the output voltage change and primary and secondary isolation. When output voltage changes, the feedback voltage will be compared and duty cycle will be decided to control the correct output voltage. (See Fig.7)

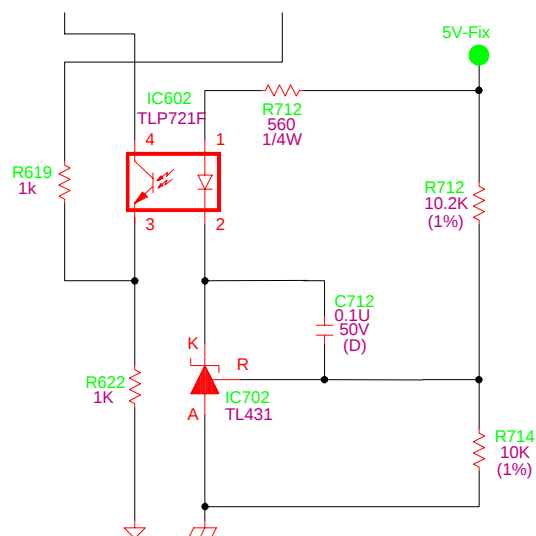
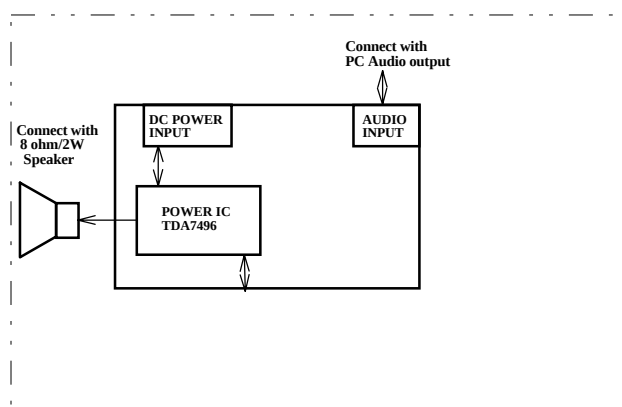


Fig. 7

Chapter 2 Circuit Operation Theory



The Audio Speaker is consist of a Audio board. The Audio Speaker have DC Volumn control, use 28mmX40mm Speaker (2W/per chennal),power supply from AC-DC board and Audio input from PC Audio output (Line Out) .

- (A) Power IC: Use ST POWER IC TDA7496. The IC are stereo AB Class output amplifiers with DC Volume control. The devices are designed for use in TV and monitor, but are also suitable for battery-Fed portable recorders and radios. Use +12V from AC-DC Board and connect speaker to offer 1W per chennal.
- (B) DC Power Input: To supply +12V to be VCC source Voltage for TDA7496 and built-in AC-DC board.
- (C) Audio Input: connect with PC Audio output in 3.5mm to 3.5mm signal line.
- (D) Speaker: Use 8 ohm and 28mmX40mm speaker (2W/per chennal)
- (E) DC Volumn Control: The voltage range is 1 – 5 V (From MC)

Alignment procedure (for function adjustment)

1. Enter factory area (press “enter” & “exit” then “power on”).
2. Select timing from figure 1. The timing marked with star sign (*) have to be adjusted. Clear user area in EEPROM.
3. Adjust the contrast and the brightness to “50”.
4. Press I-key to adjust the image.
5. Check the phase of the image; if phase is not perfect adjust it to the best step.
6. Save factory parameter then turn off power.
7. Clear user area in EEPROM.
8. Turn on power enter user area.

Incoming display mode (Input timing)					Multi-scan operation
Resolution	Horizontal Frequency (KHz)	Vertical Frequency (Hz)	Dot Clock Frequency (MHz)	Remark	Actual display resolution
*640x350	31.47(P)	70.08(N)	25.17	DOS	Full screen 1280x1024
*720x400	31.47(N)	70.08(P)	28.32	DOS	
*640x480	31.47(N)	60.00(N)	25.18	DOS	
*640x480	35.00(N)	67.00(N)	30.24	Macintosh	
*640x480	37.86(N)	72.80(N)	31.5	VESA	
*640x480	37.50(N)	75.00(N)	31.5	VESA	
*800x600	37.88(P)	60.32(P)	40.00	VESA	
*800x600	48.08(P)	72.19(P)	50.00	VESA	
*800x600	46.86(P)	75.00(P)	49.50	VESA	
832X624	49.72(N)	74.55(N)	57.29	Macintosh	
*1024x768	48.36(N)	60.00(N)	65.00	VESA	
1024x768	56.48(N)	70.10(N)	75.00	VESA	
*1024x768	60.02(P)	75.00(P)	78.75	VESA	
1024X768	60.24(N)	74.93(N)	80.00	Macintosh	
1152x864	67.50(P)	75.00(P)	108.00	VESA	
1152x870	68.68(N)	75.06(N)	100.00	Macintosh	
1152x900	61.80(P)	66.00(P)	92.94	SUN 66	
1152x900	71.81(N)	76.14(N)	108.00	SUN	
1280x960	60.00(P)	60.00(P)	108.00	VESA	
1280x960	75.00(P)	75.00(P)	129.60	VESA	
*1280x1024	64.00(P)	60.00(P)	108.00	VESA	
*1280x1024	75.83(N)	71.53(N)	128.00	IBM1	
*1280x1024	80.00(P)	75.00(P)	135.00	VESA	
1280x1024	81.18(N)	76.16(N)	135.09	SPARC2	

Figure 1.

Table of Contents

1. No Picture or Picture is unstable:2

2. BUTTON function:3

 2.1 Control Board3

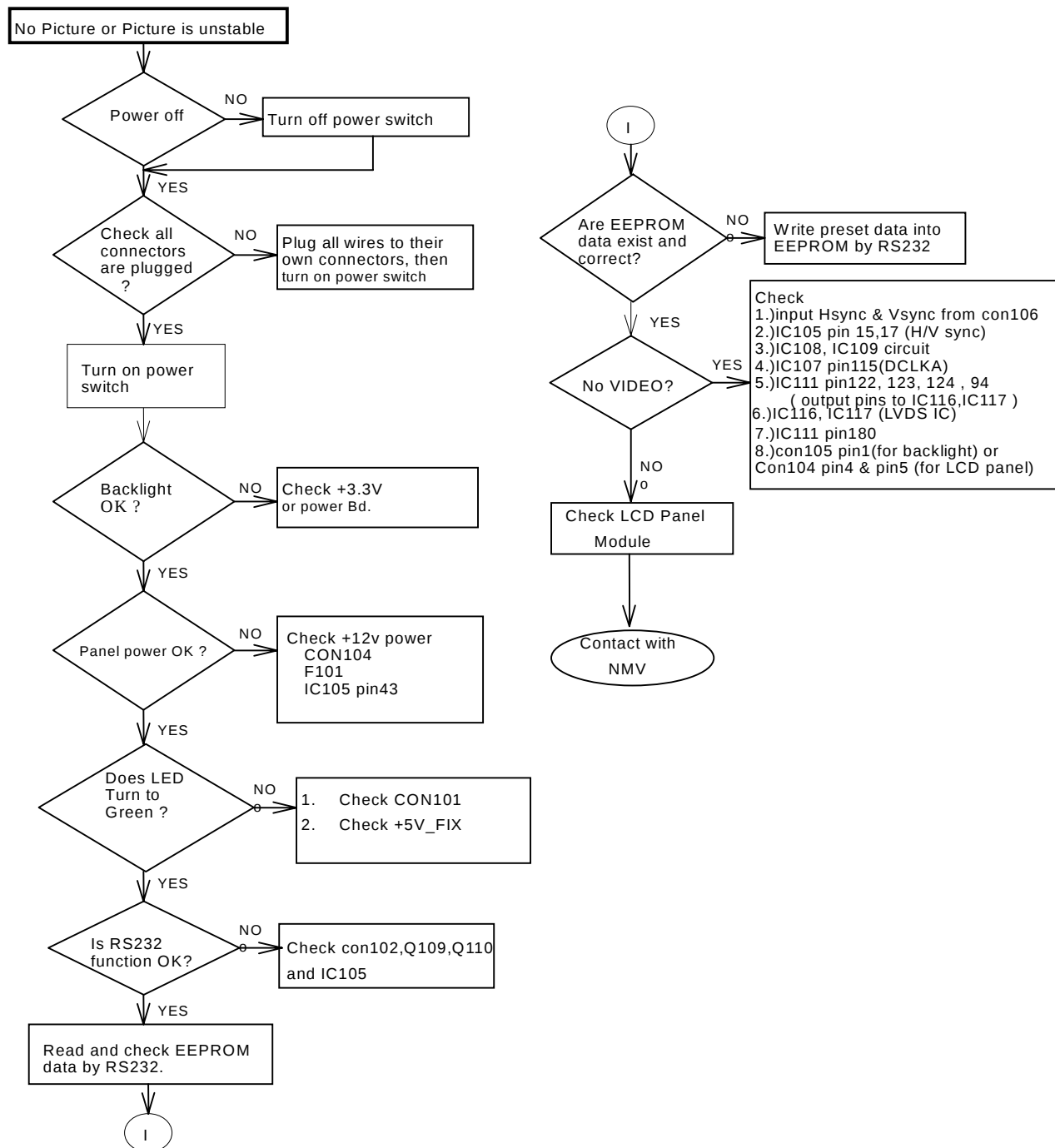
3. DDC function :3

 3-1. Interface Board:.....3

4. OSD function:4

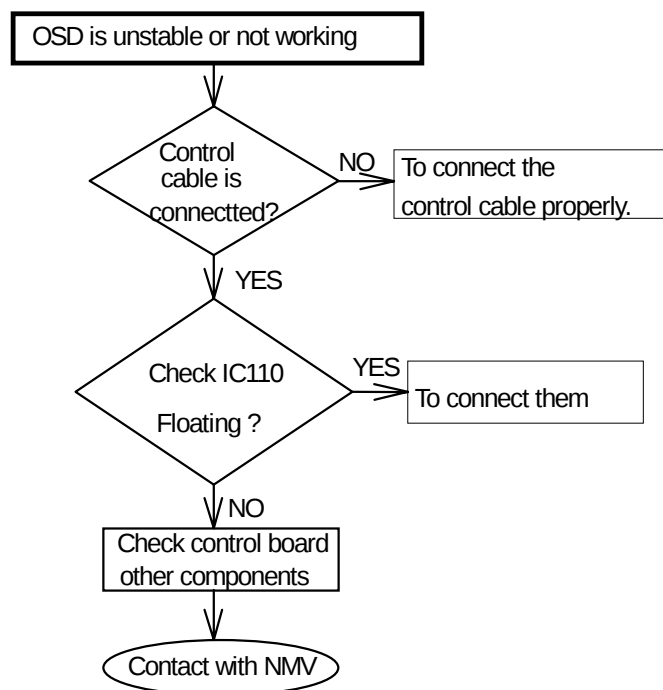
NMVS 1700M+ TROUBLE SHOOTING GUIDE

1. No Picture or Picture is unstable:



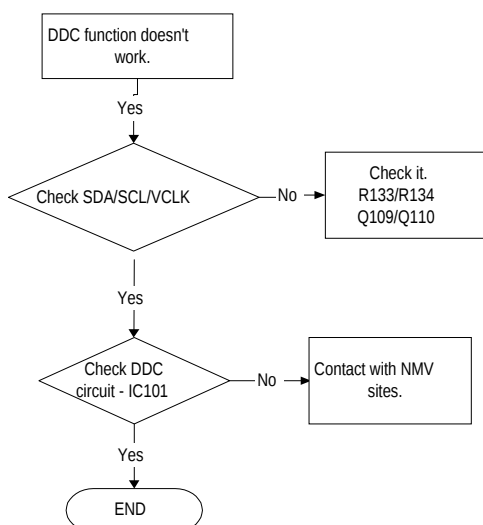
2. BUTTON function:

2.1 Control Board



3. DDC function :

3-1. Interface Board:



4. OSD function:

