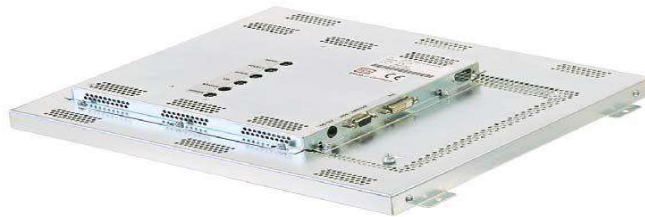


Product Specification

DT-M170EG2CAD



August 2012

Preliminary

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2. General Description

2.1 Product Description

The DT-M170EG2CAD consists of a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching device. This module has a 43.2 cm (17.0 inch) diagonally measured active area with SXGA resolutions (1280 horizontal by 1024 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripes. This module can display 16,7M colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type. The Module DT-M170EG2CAD is no complete monitor but a component. Drive peripherals as interface card, OSD-board, etc. are adapted to the display by a metal covering. The components are tested and tuned to work together perfectly.

2.2 Basic Components

| Item | Description | Manufacturer |
|---------------------------------------|-----------------------------|--------------|
| 43.2 cm (17.0") Active Matrix TFT LCD | G170EG01 | AU Optronics |
| Interface-Controller | DCMR-40E6U1 TTL/LVDS | Uplusvision |
| OSD-Board | EPAS-OSD1 SMD LED | Uplusvision |

2.3 Liability

Distronik is not responsible for changes of the components of the Module. This specification is subject to change without notification. This specification refers to the specifications of the manufacturers of the parts. If required, Distronik will send the full specification of the included components.

3. General Features

| Item | Description | Remarks |
|-------------------------|-------------------------------------|-------------------|
| Diagonal | 43.2 (17.0") | cm |
| Active area | 337.92 (H) x 270.336 (V) | mm |
| Resolution – display | 1280 x 1024 | pixel |
| Resolution – controller | 640 x 480 – 1280 x 1024 | pixel |
| Pixel pitch | 0.264 (H) × 0.264 (V) | mm |
| Pixel arrangement | RGB vertical stripe | |
| Display colors | 16,7 Mio. | colors |
| Display mode | Normally White | |
| Brightness | 350 | cd/m ² |
| Contrast ratio | 1000:1 | |
| Viewing angle | hor.: 85° / 85°, ver.: 80° / 80° | deg. |
| Response time | 5 | msec |
| Interface | Analog-RGB H-Sync. / V-Sync. // DVI | |
| H-Sync. | 31.4 – 80 | KHz |
| V-Sync. | 60 – 75 | Hz |
| Power input voltage | 12 | V DC |
| Power consumption | 20 | W |
| Dimension | 379.4 x 298.1 x 32.8 | mm |
| Weight | 2,590 | gram |
| RoHS compliance | Yes | |

4. Electrical Specification

4.1 Input Signal Characteristics

| Description | Signal | Unit | Min | Typical | Max | Notes |
|-------------|-----------------------|---------|------|---------|-------|-------|
| RGB Input | Analog RGB | • Vp-p | 0 | - | 0.7 | |
| | Sync | • Vdc | 0 | - | 5.5 | |
| | Horizontal Frequency | • KHz | 31.4 | - | 80 | |
| | Vertical Frequency | • Hz | 60 | - | 75 | |
| DVI Input | Differential Output | • mVp-p | 150 | - | 1200 | |
| | Input clock Frequency | • MHz | 25.2 | - | 136.8 | |

4.2 Power Supply and Supply Voltage Ripple

| Input Signal | Description | Unit | Min | Typical | Max | Remarks |
|--------------|-------------------|-------|------|---------|------|---------|
| DC Input | DC Voltage | Vdc | 11.4 | 12 | 12.6 | |
| | Power Consumption | Watts | - | 20 | - | |

- Supply ripple voltage: 100mV

4.3 Connector Pin Assignment and Description

4.3.1 Signal Input Pin Assignment

Analog-RGB Input Connector

Signal Connector: 15 pin HD D-SUB female connector

| Group | Pin No. | Symbol | Description |
|------------|---------|---------|-----------------|
| Analog RGB | 1 | Red | Analog Red |
| | 2 | Green | Analog Green |
| | 3 | Blue | Analog Blue |
| | 4 | ID2 | Reserved |
| | 5 | GND | Digital GND |
| | 6 | RGND | Red Return |
| | 7 | GGND | Green Return |
| | 8 | BGND | Blue Return |
| | 9 | VGA +5V | +5V |
| | 10 | SGND | Sync GND |
| | 11 | ID0 | Reserved |
| | 12 | SDA | DDC Serial Data |
| | 13 | HSync | Horizontal Sync |
| | 14 | VSynC | Vertical Sync |
| | 15 | SCL | DDC Data Clock |

DVI Input Connector

Signal Connector: DVI-D 24+1pin standard single connector

| Group | Pin No. | Symbol | Description | Pin No. | Symbol | Description |
|-------|---------|----------|----------------|---------|--------|-----------------|
| DVI | 1 | RX2- | DVI Data 2- | 16 | HPD | Hot Plug Detect |
| | 2 | RX2+ | DVI Data 2+ | 17 | RX0- | DVI Data 0- |
| | 3 | GND | 2/4 Shield | 18 | RX0+ | DVI Data 0+ |
| | 4 | NC | DVI Data 4- | 19 | GND | 0/5 Shield |
| | 5 | NC | DVI Data 4+ | 20 | NC | DVI Data 5- |
| | 6 | SCL | DDC Data Clock | 21 | NC | DVI Data 5+ |
| | 7 | SDA | DDC Data | 22 | GND | Clock Shield |
| | 8 | NC | Analog V-Sync | 23 | RXC+ | DVI Clock+ |
| | 9 | RX1- | DVI Data 1- | 24 | RXC- | DVI Clock- |
| | 10 | RX1+ | DVI Data 1+ | | | |
| | 11 | GND | 1/3 Shield | | | |
| | 12 | NC | DVI Data 3- | | | |
| | 13 | NC | DVI Data 3+ | | | |
| | 14 | DVI +5V | +5V | | | |
| | 15 | SYNC GND | Check DVI | | | |

4.3.2 Power Supply Pin Assignment

Power Input Connector

Type: DC Jack

| Pin No. | Symbol | Description | Note |
|---------|--------|-------------|------|
| 1 | Vin | 12V DC | |
| 2 | GND | GND | |

5. Optical Specifications

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = $25 \pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0° . We refer to $\theta_{\Phi=0}$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta_{\Phi=90}$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta_{\Phi=180}$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta_{\Phi=270}$ ($=\theta_6$) as the 6 o'clock direction ("bottom"). While scanning θ and/or Φ , the center of the measuring spot on the display surface shall stay fixed. The measurement shall be executed after 30 minutes warm-up period. VDD shall be 5.0V +/- 10% at 25°C .

5.1 Optical Characteristics

[VDD=5.0V, Frame rate=60Hz, Clock=54MHz, I_{BL}= 1.18 A, Ta = 25±2°C]

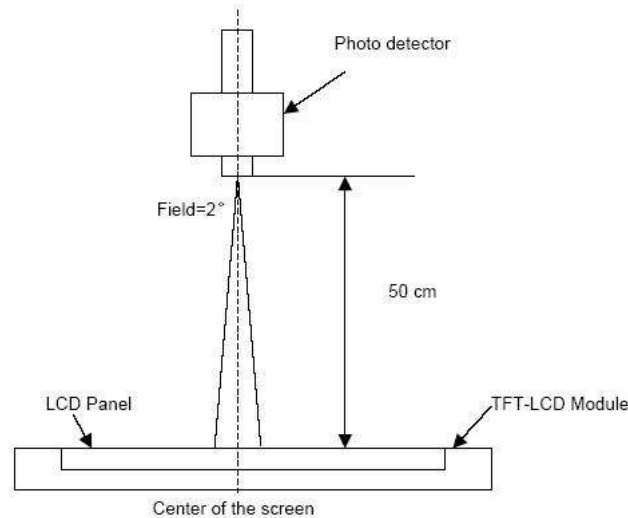
| Parameter | Symbol | Condition | Min | Typ | Max | Unit | Remarks | |
|----------------------------|----------------|----------------|--|-------|-------|-------------------|---------|--------|
| Viewing Angle | Horizontal | Θ_3 | 70 | 85 | - | Deg | Note 1 | |
| | | Θ_9 | 70 | 85 | - | Deg | | |
| | Vertical | Θ_{12} | 70 | 80 | - | Deg | | |
| | | Θ_6 | 70 | 80 | - | Deg | | |
| | Horizontal | Θ_3 | CR > 5 | 75 | 85 | - | | Deg |
| | | Θ_9 | CR > 5 | 75 | 85 | - | | Deg |
| | Vertical | Θ_{12} | CR > 5 | 75 | 85 | - | | Deg |
| | | Θ_6 | CR > 5 | 75 | 85 | - | | Deg |
| Luminance contrast ratio | CR | | 600 | 1000 | - | | Note 2 | |
| Luminance of white | Y _W | | 280 | 350 | - | cd/m ² | Note 3 | |
| White luminance uniformity | ΔY | | 75 | 80 | - | % | Note 4 | |
| Reproduction of color | White | W _x | $\Theta = 0$ (Center) Normal Viewing Angle | 0.283 | 0.313 | 0.343 | | Note 5 |
| | | W _y | | 0.299 | 0.329 | 0.359 | | |
| | Red | R _x | | TBD | TBD | TBD | | |
| | | R _y | | TBD | TBD | TBD | | |
| | Green | G _x | | TBD | TBD | TBD | | |
| | | G _y | | TBD | TBD | TBD | | |
| | Blue | B _x | | TBD | TBD | TBD | | |
| | | B _y | | TBD | TBD | TBD | | |
| Response time | Tr | | | 5 | 9 | | Note 6 | |
| | Td | | | | | | | |
| Cross talk | CT | | - | - | 1.5 | % | Note 7 | |
| Flicker | Db | | | | -20 | | Note 8 | |

Notes:

- Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90° (θ) horizontal left and right and 90° (Φ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.
- Contrast measurements shall be made at viewing angle of $\theta = 0^\circ$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

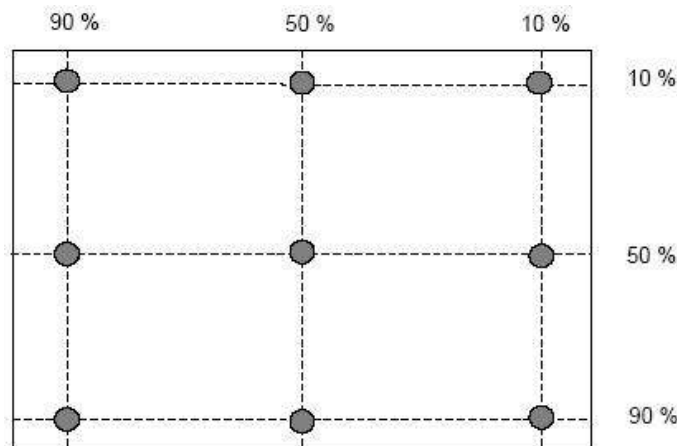
$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

Figure 1: Measurement set up



- Center Luminance of white is defined as the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

Figure 2: Average Luminance Measurement Locations & Uniformity Measurement Locations

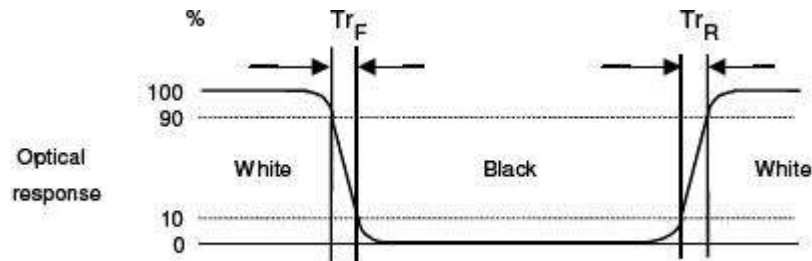


- The White luminance uniformity on LCD surface is then expressed as:

$$\delta_{W9} = \left(\frac{\text{Minimum Luminance of 9points}}{\text{Maximum Luminance of 9points}} \right)$$
 (See FIGURE 2).
- The color chromaticity coordinates shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
- The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time), and from "Full White" to Full

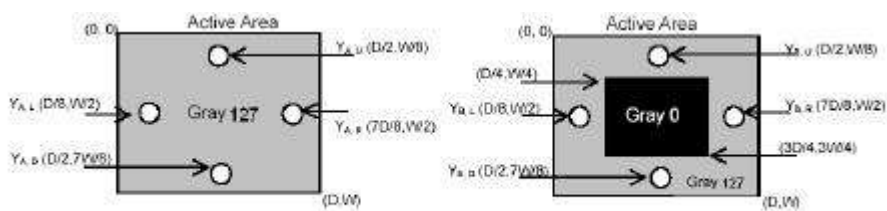
Black" (falling time), respectively. The response time is an interval between the 10% and 90% of amplitudes.

Figure 3: Response Time Testing



7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when any adjacent area is driven dark. (See FIGURE 4).

Figure 4: Cross Modulation Test Description



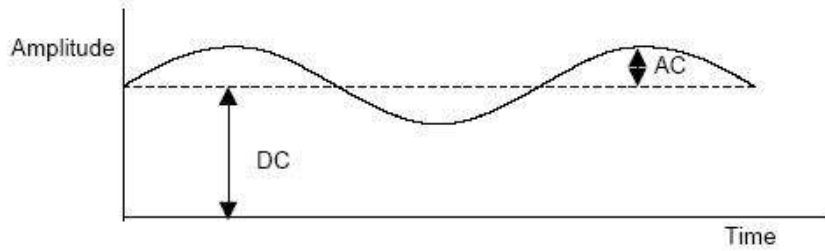
Where:

Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m^2)

8.

Method: Record dBV & DC value with (WESTAR)TRD-100



$$\text{Flicker (dB)} = 20 \log \frac{\text{AC Level(at 30 Hz)}}{\text{DC Level}}$$

5.2 LED Backlight Life

| Parameter | Min | Typ | Max | Unit | Remarks |
|--------------------|--------|-----|-----|------|--------------------------|
| LED Backlight Life | 50.000 | | | hrs | I _{BL} = 1.18 A |

6. OSD Adjustment

The DT-M170EG2CAD gives a various and very easy graphics interface to its users. Users have easy access to the functions that they want to adjust. Be sure that your system's power and LED are turned on before the OSD controls are being used.

6.1 OSD LED Operating Mode

| Power | Signal Input | LED (Red) | LED (Green) |
|-------|--------------|-----------|-------------|
| On | Plugged | Off | On |
| Off | Plugged | Off | Off |
| On | Unplugged | On | On |
| Off | Unplugged | Off | Off |

6.2 Key Name and Function

| No. | Button name | Switch Function |
|---------|-------------|---|
| 1 | Menu | 1. First click : Appears the OSD main menu 2. Second click : Exit sub & main menu |
| 2 | Select | HOT KEY FOR INPUT SIGNAL SELECTION 1. Select main & sub menu function 2. Confirmation button for selected menu points 3. Back to the sub menu |
| 3 | Up(Right) | 1. Move up/right main & sub menu 2. Increase selected value |
| 4 | Down(Left) | HOT KEY FOR AUTO ADJUSTMENT 1. Move down/left main & sub menu 2. Decrease selected value |
| SMD-LED | Status | look at 6.1 OSD LED Operating Mode |
| 5 | Power | 1. Turns ON/OFF the system |

Accessing the menu system:

1. With the OSD off, push the **Menu** button to activate the main OSD menu.
2. Use the **Up** and **Down** buttons to move through the main menu. To select a desired sub menu, press the **Select** button after your selection. The selection tabs are highlighted.
3. After selecting sub menu use the **Up** and **Down** buttons to move through the sub menu. To select a setting icon, press the **Select** button after your selection. The selected icons are highlighted.
4. There are two types of icons: some have a single function and must be confirmed with the **Select** button, the other options are setting bars. Once a setting bar appears, it can be increased or decreased via the **Up** and **Down** buttons. The setting bar moves and the numeric value indicator changes to reflect your adjustments.
Note: The numeric value indicator is provided as a point of reference only and has nothing to do with a real measurement.
5. There are different ways to close the OSD menu:
 - (a) Waiting some seconds (**timeout**). This time can be adjusted as needed in the sub menu OSD-Menu → OSD-Timer.
 - (b) After an auto adjustment and confirmation the OSD menu closes automatically.
 - (c) After a factory reset and confirmation the OSD menu closes automatically.
 - (d) In the sub menu: Press the **Menu** button two times to leave the sub menu.
 - (e) In the main menu: Press the **Menu** button to leave the OSD menu.
 - (f) After adjusting a setting, press the **Select** or **Menu** button. Now your selected sub menu is highlighted. Confirm your selection with the **Menu** button to leave the sub menu. This highlights your menu selection in the main menu. Confirm again with the **Menu** button to leave the OSD menu.

6. Auto Adjustment without opening OSD menu:

- Press the **Down** button and an auto adjustment will be done automatically.

7. Input signal selection without opening OSD menu:

- Press the **Select** button and a signal selection will be done automatically.

8. Booting with different input signals

If you boot the Module device with RGB and DVI parallel, it is possible to change between both input signals. If you boot the Module device either with RGB or DVI, there will be an automatically signal input detection. Not connected signal inputs won't be recognized. The Module device identify the connected signal input, otherwise it will go into a sleeping mode. Furthermore, the Module device search the last input signal, this is recognized as the prior input.

9. Storing of Display settings

If you disconnect the power supply or signal cable, all your previous display settings e.g. brightness, contrast, clock, phase etc. will be stored.

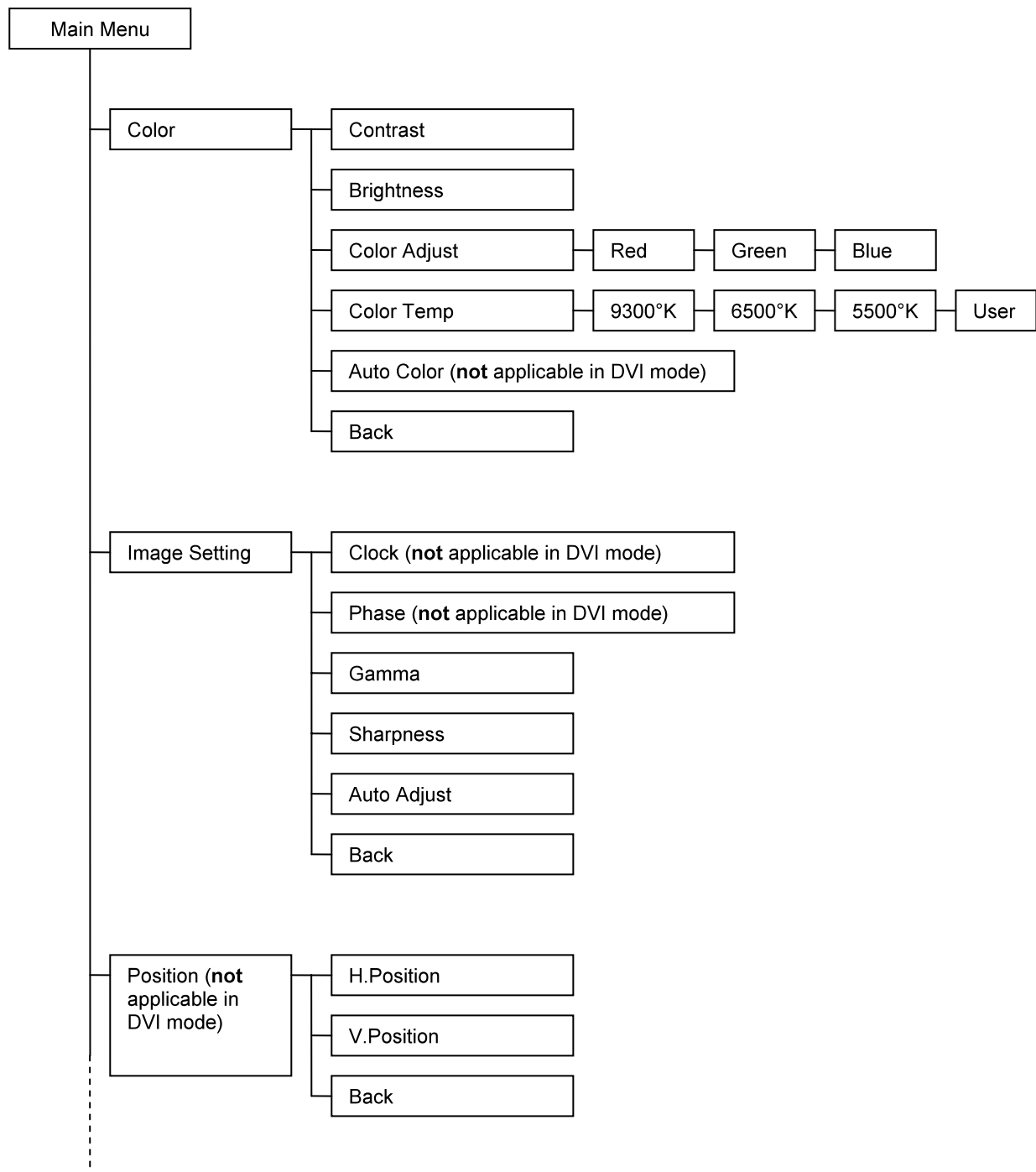
REMARK:

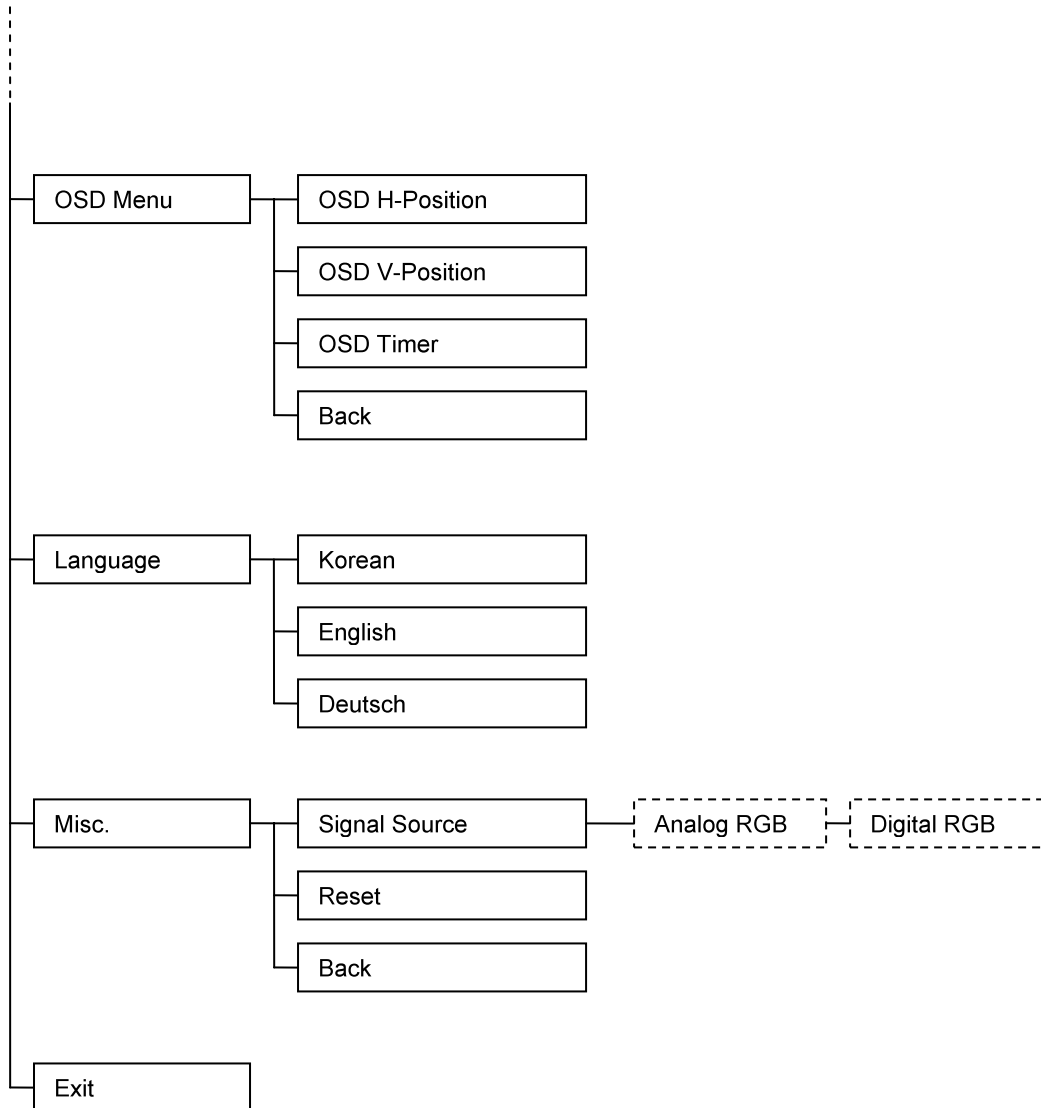
If you use the Module device with different resolutions, it is necessary to do an auto adjustment in all your operating modes. The different resolution will be stored as well. If you change your operating mode between the different resolutions, the image will be automatically 100% central adjusted.

10. Reset procedure

If you want to have a factory reset, so you have to precede a reset in your entire operating mode. Please do at first a reset on DVI-Side and after that a reset on RGB side. Right after doing it, there should be a message on the screen: "INITIALIZE"/"Auto Adjust".

6.3 Menu Structure

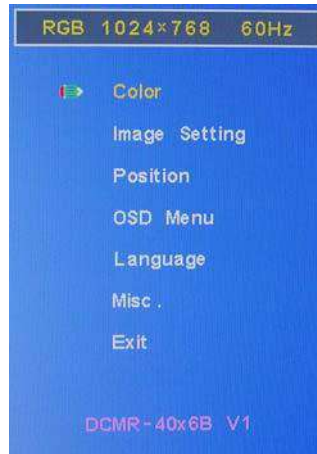




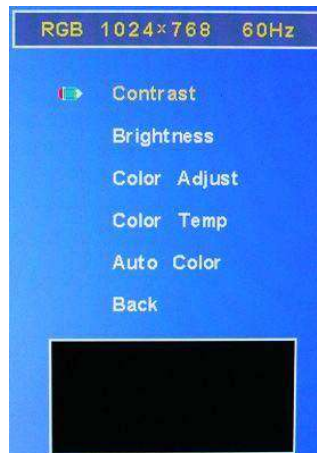
6.4 Window Structure

6.4.1 Color

Main Menu



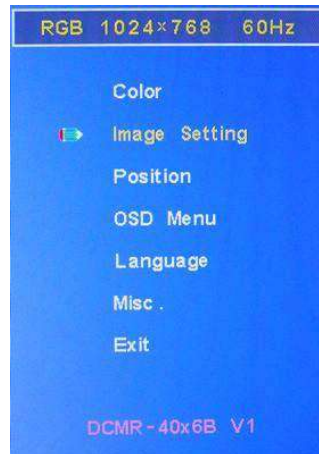
Sub Menu "Color"



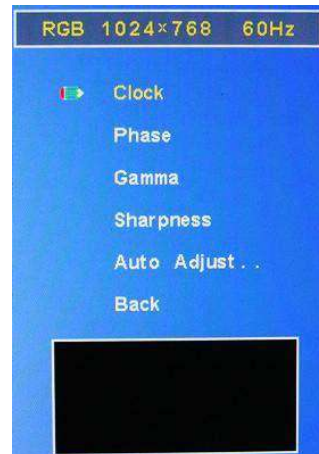
- **Contrast:** Adjusts image contrast.
- **Brightness:** Adjusts displays brightness. Brightness will be regulated using the connected inverter.
- **Color Adjust:** Adjusts image color.
 - **USER:**
 - **RED:** Adjusts red color.
 - **GREEN:** Adjusts green color.
 - **BLUE:** Adjusts blue color.
- **Color Temp.:** Selects different color temperatures (9300°K / 6500°K / 5800°K / USER)
- **Auto color:** Adjusts image color automatically.
- **Back:** You will leave the sub menu back to main menu **OR** press menu button and you will leave the sub menu back to main menu.

6.4.2 Image Setting

Main Menu



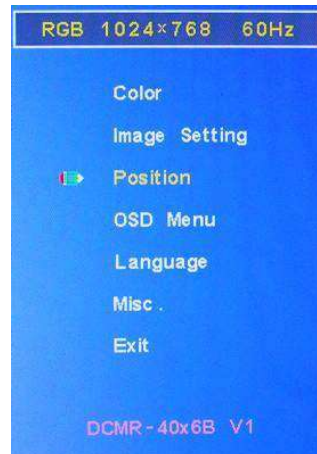
Sub Menu "Image Setting"



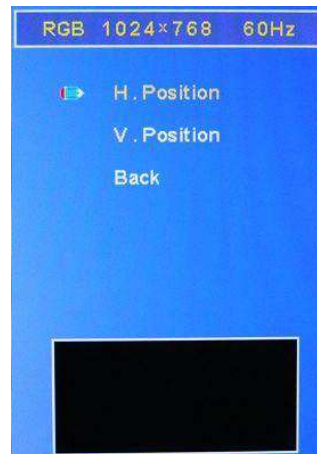
- **Clock:** Adjusts clocks per line (maximum length of line).
- **Phase:** Adjusts image phase.
- **Gamma:** Adjusts image gamma level.
- **Sharpness:** Adjusts image sharpness.
- **Auto Adjust:** Optimizes the displayed image. Adjusts phase and image position automatically (Message on the screen: "Auto Adjust..").
- **Back:** You will leave the sub menu back to main menu **OR** press menu button and you will leave the sub menu back to main menu.

6.4.3 Position

Main Menu



Sub Menu "Position"



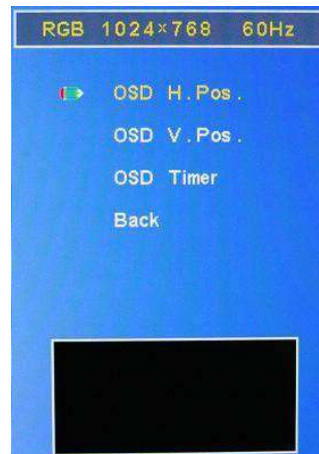
- **H.Position:** Adjusts horizontal image position.
- **V.Position:** Adjusts vertical image position.
- **Back:** You will leave the sub menu back to main menu **OR** press menu button and you will leave the sub menu back to main menu.

6.4.4 OSD Menu

Main Menu



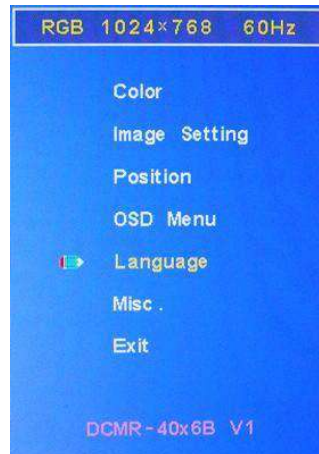
Sub Menu "OSD Menu"



- **OSD Horizontal Position:** Adjusts OSD position horizontally.
- **OSD Vertical Position:** Adjusts OSD position vertically.
- **OSD Timer:** The OSD vanishes after a certain time of inactivity. Values of 5-20s are possible.
- **Back:** You will leave the sub menu back to main menu **OR** press menu button and you will leave the sub menu back to main menu.

6.4.5. Language

Main Menu



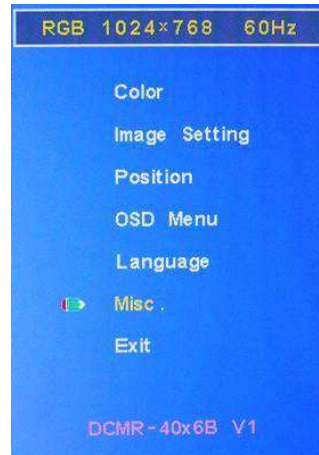
Sub Menu "Language"



- **Language:** Selects your adequate language (Korean, English, Deutsch).

6.4.6 Misc.

Main Menu



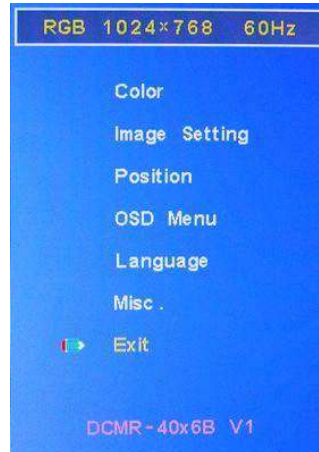
Sub Menu "Misc."



- **Signal Source:** Selects different input signals (either Analog RGB or Digital RGB)
- **Reset:** Restores factory settings (Message on the screen: "INITIALIZE") – **PLEASE FOLLOW THE ADVICE ON PAGE 14 Point 10 "Reset procedure"**.
- **Back:** You will leave the sub menu back to main menu **OR** press menu button and you will leave the sub menu back to main menu.

6.4.7 Exit

Main Menu



- **Exit:** Leaves the OSD-Menu

7. Environmental and Reliability Specification

The Reliability items and its conditions are shown in below.

| No. | Items | Conditions | Note |
|-----|---|---|------|
| 1 | Temperature (operating) | 0 °C – 50 °C | 1 |
| 2 | Temperature (non-operating) | -30 °C – 85 °C | |
| 3 | Temperature Humidity Bias | 50 °C, 80RH, 300 hours | |
| 4 | Vibration test (non operating) | Acceleration: 1.5G Wave: Random Frequency: 10 - 200 -10 Hz Sweep: 30 minutes each Axis (X-Y-Z) | |
| 5 | Shock test (non operating) | Acceleration: 50G Wave: half-sine Active time: 20ms Direction: ±X, ±Y, ±Z (one time for each axis) | |
| 6 | Electro-static discharge test (non-operating) | Air: ±15 KV, 150pF (330Ω) 1 sec, 8 points, 25 times/point Contact: ±8 KV, 150pF (330Ω) 1 sec, 8 points, 25 times/point | |
| 7 | Thermal shock test (TST) | -20°C/30 min, 60°C/30min, 100cycles | |
| 8 | On/Off-Test | On/10 sec, Off/10 sec; 30,000 cycles | |
| 9 | Altitude Test | Operation: 10,000 feet, Non-Operation: 30,000 feet | |

Note:

1. It is the user responsibility to keep this temperature within the above specification.

- The DT-M170EG2CAD is no independent final product. Therefore Distronik is not obliged to fulfil directives of EC Declaration of Conformity.
- The customer is responsible for certification of the end device.
- Independent from that for customers' support Distronik declares that the product complies with the requirements of the following European directive(s):

EMC Directive No.: 2004/108/EG

The compliance of the product with the requirements of this directive(s) was proved by the application of the following standards:

EN 55022:2006 +A1:2007 Information Technology Equipment – Radio Disturbance Characteristics – Limits and methods of Measurement

EN 55024:1998 +A1:2001 +A2:2003 Information Technology Equipment – Immunity Characteristics – Limits and methods of Measurement

• 8. Mechanical Specifications

8.1 Dimensional Requirements

Figure 1 shows mechanical outlines for the Moduel. Other parameters are shown in the below-mentioned table.

Dimensional Parameters

Parameter Specification Unit

| | | | |
|---------------------|-------------------------------------|--|-------|
| Dimensional outline | Horizontal Vertical Thickness | 379.4 +/- 0.5 298.1 +/- 0.5 32.8 +/- 0.5 | mm |
| Weight | | 2,590 | gram |
| Active Area | | 337.92 (H) x 270.336 (V) | mm |
| Pixel pitch | | 0.264 (H) x 0.264 (V) | mm |
| Number of pixels | | 1280 (H) x 1024 (V) (1 pixel = R+G+B dot) | pixel |
| Back light | | LED backlight unit | |

8.2 Anti-Glare and Polarizer Hardness

The surface of the LCD has an anti-glare coating to minimize reflection and a coating to reduce scratching.

9. Handling & Cautions

Cautions when taking out the module

- Pick the pouch only, when taking out module from a shipping package.

Cautions for handling the module

- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and backlight element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry-cloth without chemicals for cleaning.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

Cautions for the atmosphere

- Dewdrop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer-packing pouch and under relatively low temperature atmosphere is recommended.

Cautions for the module characteristics

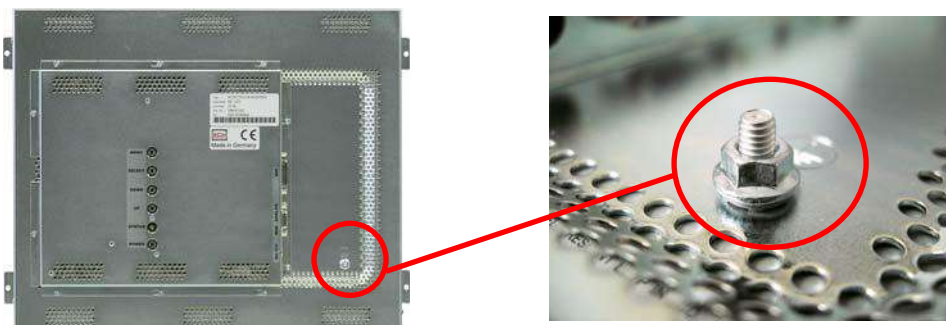
- Do not apply fixed pattern data signal to the LCD module at aging time.
- Applying fixed pattern for a long time may cause image sticking.

Other cautions

- Do not disassemble and/or re-assemble LCD module.
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc, please pack the module not to be broken. We recommend on using the original shipping packages.

REMARK:

We recommend the grounding of Module with your device. For this purpose, there is a PE connection point placed on the back side of the module.



10. Packing Information

Each of the four DT-M170EG2CAD is packed into an anti-static foil. These four units are packed into a carton filled and cushioned with shock absorbing styrofoam and therefore very good protected for shipping.

11. Appendix

11.1 Signal Timing Chart Analog RGB / DVI

| Standard | Resolution | Refresh | f_{HSYNC} | Pixel Rate |
|----------|-------------|-----------|-------------|------------|
| | | Rate (Hz) | (KHz) | (MHz) |
| | 640 x 350 | 70 | 31.4 | 25.2 |
| | 720 x 400 | 70 | 31.4 | 28.3 |
| VGA | 640 x 480 | 60 | 31.5 | 25.2 |
| | | 70 | 35.0 | 28.6 |
| | | 72 | 37.8 | 31.5 |
| | | 75 | 37.5 | 31.5 |
| SVGA | 800 x 600 | 60 | 37.9 | 40.0 |
| | | 70 | 43.8 | 45.5 |
| | | 72 | 48.1 | 50.0 |
| | | 75 | 46.9 | 49.5 |
| XGA | 1024 x 768 | 60 | 48.4 | 65.0 |
| | | 70 | 56.5 | 75.0 |
| | | 72 | 57.7 | 75.2 |
| | | 75 | 60.0 | 78.8 |
| SXGA | 1280 x 1024 | 60 | 64.0 | 108.0 |
| | | 70 | 74.4 | 124.9 |
| | | 72 | 77.9 | 134.6 |
| | | 75 | 80.0 | 135.0 |

11.2 Optional Accessories

We offer a wide variety of optional accessories to operate the SCM17EG2-R.