IEC 61747-2-2

Edition 2.0 2014-11

INTERNATIONAL STANDARD

colour inside

Liquid crystal display devices –
Part 2-2: Matrix colour LCD modules – Blank detail specification

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LIQUID CRYSTAL DISPLAY DEVICES –

Part 2-2: Matrix colour LCD modules – Blank detail specification

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61747-2-2 has been prepared by IEC technical committee 110: Electronic display devices.

This second edition cancels and replaces the first edition published in 2004. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

1) The new edition was editorially changed to follow the current ISO/IEC Directives, for example
   - added the scope;
   - re-arranged the numbering scheme;
   - added titles to the tables;

- added an Annex A , and put some text from Clause 4 and Clause 10 in it;
- removed IECQ reference;
- deleted some unnecessary text.

2) Several words and test conditions were added in Clause 7 and Clause 8.

The text of this standard is based on the following documents:

CDV	Report on voting
110/515A/CDV	110/567A/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 61747 series, under the general title *Liquid crystal display devices*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

LIQUID CRYSTAL DISPLAY DEVICES –

Part 2-2: Matrix colour LCD modules – Blank detail specification

1 Scope

This part of IEC 61747 serves as a blank detail specification (BDS) for testing and contains requirements for style and layout and minimum content of detail specifications. These requirements are applicable when the detail specification is published (e.g. for a standard product).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61747-1-1:2014, *Liquid crystal display devices – Part 1-1: Generic specification*

IEC 61747-2:1998, *Liquid crystal display devices – Part 2: Liquid crystal display modules – Sectional specification*

IEC 61747-5:1998, *Liquid crystal and solid-state display devices – Part 5: Environmental, endurance and mechanical test methods*

IEC 61747-5-2:2011, *Liquid crystal display devices – Part 5-2: Environmental, endurance and mechanical test methods – Visual inspection of active matrix colour liquid crystal display modules*

IEC 61747-10-1:2013, *Liquid crystal display devices – Part 10-1: Environmental, endurance and mechanical test methods – Mechanical*

IEC 61747-10-2:2014, *Liquid crystal display devices – Part 10-2: Environmental and endurance measurements*

3 Guidance for preparation of a detail specification

The front page layout is illustrated. When the detail specifications for customer circuits are not published, the layout requirements of the blank detail specification are optional. A suggested front page layout is also illustrated. An example of a customer detail specification (CDS) is also given.

The numbers between square brackets on the front page of the blank detail specification illustrated correspond to the following indications which should be given:

[1] The name of the National Standards Organization or NAI (National Authorised Institution) under whose authority the detail specification is issued.

[2] The number of the detail specification.

[3] The numbers and issue numbers of the generic and sectional specifications.

[4] The national number of the detail specification, date of issue and any further information, if required by the national system.

[5] Type number(s) of device.

[6] Information on typical construction and applications. If a device is designed to satisfy several applications, this shall be stated here. Characteristics, limits and inspection requirements for these applications shall be met. If a device is electrostatic sensitive, or contains hazardous materials, a caution statement shall be added in the detail specification.

[7] Outline drawing and/or reference to the relevant document for outlines.

[8] Category of assessment level.

[9] Reference data on the most important properties to permit comparison between types.

Layout of blank detail specification (BDS):

<table>
<tr><td>[Name (address) of responsible NAI (and possibly of body from which the specification is available)] [1]</td><td>[Number of detail specification plus issue number and/or date.] [2]</td></tr>
<tr><td>ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH: [3]
Generic specification: IEC 61747-1-1:2014
Sectional specification: IEC 61747-2:1998
[and national references if different]</td><td>[National number of detail specification] [4]
[This box need not be used if national number repeats the number of the detail specification.]</td></tr>
<tr><td colspan="2">BLANK DETAIL SPECIFICATION FOR: MATRIX COLOUR LCD MODULES [5]
[Type number(s) of the relevant device(s) and if appropriate structurally similar devices.]
Ordering information: see Clause 5 of this standard.</td></tr>
<tr><td>Mechanical description</td><td>Short description</td></tr>
<tr><td rowspan="3">Outline references: [7]
[Mandatory if available, IEC and/or national number]
Structure:
e.g. – LCD with integrated circuits (ICs) mounted on cell substrate or separate printed circuit board (PCB)
– integrated light source and/or reflector
[The description “integrated light source” should be specified properly in a detail specification, e.g. “backlight” or “front-light”.]
Outline drawing and dimensions:
– overall dimensions
– viewing area
– effective display area
Display format:
– number of pixels/dots
– pixel/dot pitch
– colour pixel/dot arrangement
Connection type:
e.g. – pin identification
– connector identification
– type number of connector used
– type number of mating connector
Marking:
[The detail specification shall prescribe the information to be marked on the device.]
[See 4.3 of IEC 61747-1-1:2014 and Clause 4 of this standard.]
Mass:</td><td>Type of matrix addressing: [6]
e.g. – (amorphous silicon, poly silicon) thin film transistor (TFT), thin film diode (TFD), passive, etc.
Type of electro-optical effect:
e.g. – twisted nematic (TN), super twisted nematic
(STN), etc.
Optical mode of operation:
– transmissive, reflective, transflective
– number of colours
– number of grey levels
– normally white, normally black
Preferred viewing direction:
Electrical specification:
e.g. – interface (power supply, data)
– integrated light source: e.g. fluorescent lamp (cold cathode fluorescent lamp (CCFL)/ hot cathode fluorescent lamp (HCFL)), light emitting diode (LED), electroluminescence (EL)
Application(s):
e.g. – personal computer, automobile</td></tr>
<tr><td>Categories of assessed level</td></tr>
<tr><td>[See 4.4 of IEC 61747-1-1:2014] [8]</td></tr>
<tr><td>Reference data [9]</td></tr>
<tr><td colspan="2">Information about manufacturers which have components qualified to this detail specification is available in the current qualified products list.</td></tr>
</table>

4 Marking

Refer to 4.3 of IEC 61747-1-1: 2014.

5 Ordering information

The following minimum information is necessary to order a specified device, unless otherwise specified:

– precise type reference;
– reference of detail specification with issue number and/or date when relevant;
– category of assessed quality as defined in 4.5 of the generic specification (IEC 61747-1-1:2014) and, if required, screening sequence as defined in 4.8 of the sectional specification (IEC 61747-2:1998);
– any other particulars.

6 Limiting values (absolute maximum rating system)

The limiting values in Table 1 apply over the operating temperature range unless otherwise specified.

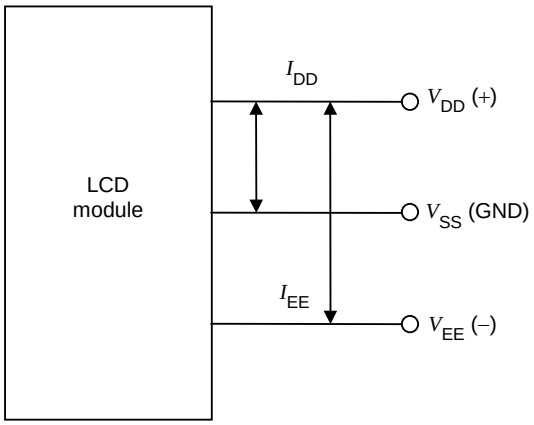
Repeat only the subclause numbers used with a title. Any additional values shall be given at the appropriate place, but without the subclause number(s).

Table 1 – Limiting values

Subclause	Parameters	Symbol	Value [a]		Unit
			Min.	Max.	
6.1	Operating ambient temperature	T_{op}	X	X	°C
6.2	Storage temperature	T_{stg}	X	X	°C
6.3	Supply voltage(s) (select either the pair of 6.3.1 and 6.3.2, or 6.3.3)				
6.3.1	Supply voltage for logic drive	$V_{DD} - V_{SS}$	X	X	V
6.3.2	Supply voltage for LCD drive	$V_{DD} - V_{EE}$ or $V_{EE} - V_{SS}$ or $V_O - V_{SS}$ or $V_{DD} - V_O$	X	X	V
6.3.3	Supply voltage(s) for module	V_{MDL} or V_{MDL1}, V_{MDL2}, etc.	X	X	V
6.4	Input signal voltage	V_{IN}	X	X	V
6.5	Backlight voltage (where appropriate)	V_{BL}		X	V
6.6	Soldering temperature (where appropriate)	T_{sld}		X	°C

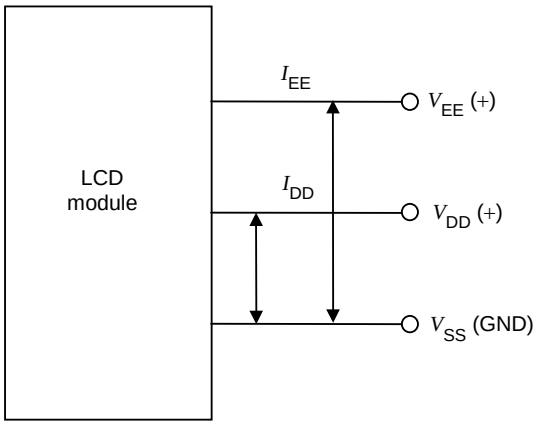
[a] Throughout this standard, when a characteristic or rating applies, “X” denotes that a value shall be inserted in the detail specification.

Block diagram examples for explanation of supply voltages refer to Figure 1.



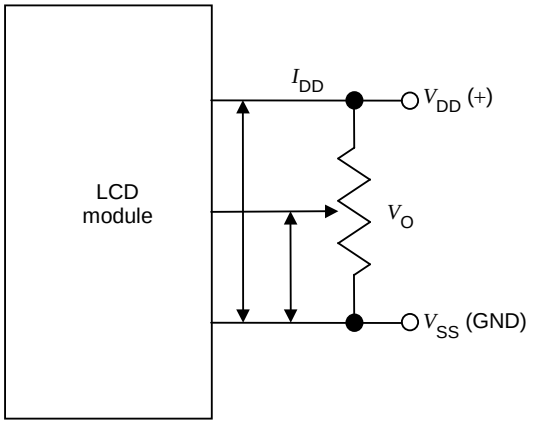
Supply voltage for LCD drive: $V_{DD} - V_{EE}$

Supply voltage for logic drive: $V_{DD} - V_{SS}$



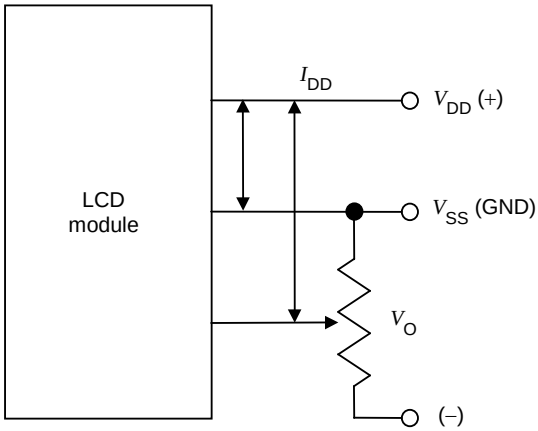
Supply voltage for LCD drive: $V_{EE} - V_{SS}$

Supply voltage for logic drive: $V_{DD} - V_{SS}$



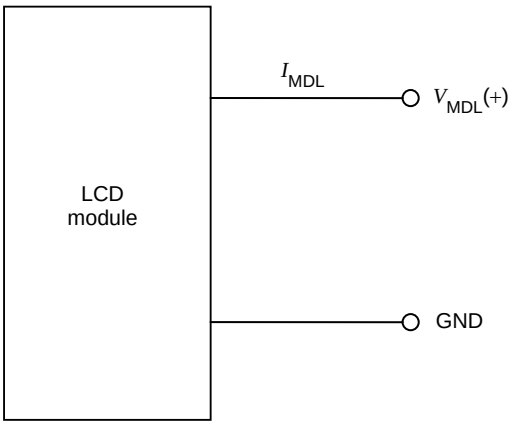
Supply voltage for LCD drive: $V_O - V_{SS}$

Supply voltage for logic drive: $V_{DD} - V_{SS}$



Supply voltage for LCD drive: $V_{DD} - V_O$

Supply voltage for logic drive: $V_{DD} - V_{SS}$



Supply voltage for module: V_{MDL}

IEC

Figure 1 – Block diagram examples for explanation of supply voltages

7 Operating range and electrical and optical characteristics

7.1 Recommended operating range

The “X” denotes that a value in Table 2 shall be inserted in the detail specification.

Table 2 – Recommended operating range

Subclause	Parameters Characteristics at T_{op} = 25 °C unless otherwise specified	Symbol	Value		Unit
			Min.	Max.	
7.1.1	Operating voltage range of supply voltage(s) (select either the pair of 7.1.1.1 and 7.1.1.2, or 7.1.1.3)				
7.1.1.1	Supply voltage for logic drive	$V_{DD} - V_{SS}$	X	X	V
7.1.1.2	Supply voltage for LCD drive	$V_{DD} - V_{EE}$ or $V_{EE} - V_{SS}$ or $V_{O} - V_{SS}$ or	X	X	V
7.1.1.3	Supply voltage(s) for module	$V_{DD} - V_{O}$ V_{MDL} or V_{MDL1}, V_{MDL2} etc.	X	X	V
7.1.2	Operating voltage range of input signal voltages	V_{IN}			
7.1.2.1	Input signal voltage, high	V_{IH}	X	X	V
7.1.2.2	Input signal voltage, low	V_{IL}	X	X	V
7.1.3	Operating voltage range of analogue video signals (where appropriate)	V_{VID}	X	X	V
7.1.4	Operating voltage range of backlight voltages (where appropriate)	V_{BL}	X	X	V
7.1.4.1	Discharge ignition voltage of backlight (where appropriate)	V_{BLIG}	X	X	V
7.1.5	Operating frequency range(s) (where appropriate)	f_{op}			
7.1.5.1 and/or	Operating frame frequency range	f_{FRM}	X	X	Hz
7.1.5.2	Oscillator frequency range	f_{osc}	X	X	Hz

7.2 Electrical and optical characteristics

See Clause 8 of this specification for inspection requirements.

The “X” denotes that a value in Table 3 shall be inserted in the detail specification. Repeat only the subclause numbers used with a title. Any additional characteristics shall be given at the appropriate place but without the subclause number(s).

When several devices are defined in the same detail specification, the relevant values shall be given on successive lines, avoiding repeating identical values.

Table 3 – Electrical and optical characteristics

Subclause	Characteristics at T_{op}= 25 °C unless otherwise specified	Symbol	Unit	Value		Tested In sub-group
				Min.	Max.	
7.2.1	Supply current at specified frame frequency, specified operating supply voltage, with an adequate display pattern and other electrical driving conditions chosen in order to achieve extreme supply current	I_{tot} or I_{DD} and/or I_{EE}	mA	 X X	X X X	A3 A3 A3
7.2.2	Operating backlight current at specified operating backlight voltage (where appropriate)	I_{BL}	mA		X	A3
7.2.3.1	Contrast ratio (direct beam and/or diffused light) at specified light source and specified viewing angle	CR_{dir} and/or CR_{diff}		X		A2
7.2.3.2	Contrast ratio (direct beam and/or diffused light) T_{op} = max. and min. or specified temperature, light source and specified viewing direction	CR_{dir} and/or CR_{diff}		X		C2b
7.2.4.1	Luminance at specified viewing direction and measuring point(s) (where appropriate)	L	cd/m^2	X		A2
7.2.4.2	Luminance uniformity (where appropriate) or luminance long-range non-uniformity	L_{uni} or L_{NU}	%	X	 X	A2
7.2.5	Viewing angle range at specified definition of viewing direction and contrast ratio [c]	θ_H and θ_V	° °	X X		C2a
7.2.6.1	Rise time at specified temperature [c]	t_r	ms		X	C2a
7.2.6.2	Fall time at specified temperature [c]	t_f	ms		X	C2a
7.2.7	Transmittance (regular and/or diffuse) at specified measuring method and conditions (where appropriate)	τ_r and/or τ_f	%	X		C2a
7.2.8	Reflectance (regular and/or diffuse) at specified measuring method and conditions (where appropriate)	ρ_r and/or ρ_d	%	X	X	C2a
7.2.9.1	Chromaticity of white (x, y) (where appropriate)	x_W, y_W	[a]	[b]	[b]	A2
7.2.9.2	Chromaticity of red (x, y) (where appropriate)	x_R, y_R	[a]	[b]	[b]	A2
7.2.9.3	Chromaticity of blue (x, y) (where appropriate)	x_B, y_B	[a]	[b]	[b]	A2
7.2.9.4	Chromaticity of green (x, y) (where appropriate)	x_G, y_G	[a]	[b]	[b]	A2

[a] Coordinates (x, y) of the chromaticity diagram provided by CIE (1931).

[b] Items of value (i.e., minimum, maximum, typical or average) are determined in a detail specification.

[c] Not completed. Other specified conditions will be added after forthcoming work of standardization.

8 Test conditions and inspection requirements

Test conditions and inspection requirements are given in the following Table 4, Table 5 and Table 6, where the values and exact test conditions to be used should be specified as required for a given type, and as required by the relevant test in the relevant publications.

When several devices are included in the same detail specification, the relevant conditions and/or values should be given in sequence, avoiding where possible repetition of identical conditions and/or values.

Tests shall be made at 25 °C, unless otherwise specified.

Tests marked (D) are destructive.

Table 4 – Group A – Lot-by-lot inspection

Subgroup	Tests	Conditions at T_{op} = 25 °C unless otherwise specified (see Clause 4 of the generic specification (IEC 61747-1-1:2014))	Limits	
			Min.	Max.
A1	External visual examination (no electrical connection)		See 6.2.1 of the generic specification (IEC 61747-1-1:2014)	
A2	Visual defects		See IEC 61747-5-2:2011	
	Contrast ratio	See 7.2.3.1 of this specification	X	
	Luminance (where appropriate)	See 7.2.4.1 of this specification	X	
	Luminance uniformity (where appropriate)	See 7.2.4.2 of this specification	X	
	Chromaticity of white, blue, red and green (where appropriate)	See 7.2.9.1 to 7.2.9.4 of this specification	[a]	[a]
A3	Supply current	See 7.2.1 of this specification		X
	Operating backlight current (where appropriate)	See 7.2.2 of this specification		X

[a] Items of value (i.e., minimum, maximum, typical or average) are determined in a detail specification.

Table 5 – Group B – Lot-by-lot inspection

In the case of Category I, see 4.5 of the generic specification (IEC 61747-1-1:2014).

Subgroup	Tests	Conditions at T_{op} = 25 °C unless otherwise specified (see Clause 4 of the generic specification (IEC 61747-1-1:2014))	Limits	
			Min.	Max.
B1	Dimensions		See Clause 3 of this specification	

Table 6 – Group C – Periodic tests

Subgroup	Tests	Conditions at T_{op} = 25 °C unless otherwise specified (see clause 4 of the generic specification (IEC 61747-1-1:2014))	Limits	
			Min.	Max.
C1	Dimensions		See Clause 3 of this specification	
C2a	Viewing angle range	See 7.2.5 of this specification	X	
	Rise time	See 7.2.6.1 of this specification		X
	Fall time	See 7.2.6.2 of this specification		X
	Transmittance (where appropriate)	See 7.2.7 of this specification	X	
	Reflectance (where appropriate)	See 7.2.8 of this specification	X	X
C2b	Contrast ratio	See 7.2.3.2 of this specification	X	
C4	Bond strength for external pins (D)	See 5.7 of IEC 61747-10-1:2013		
C5	Change of temperature (D)	See 5.2 of IEC 61747-10-2:2014		
C6	Shock (D)	See 5.5 of IEC 61747-10-1:2013		
	Vibration (D)	See 5.4 of IEC 61747-10-1:2013		
C7	Damp heat cyclic (12 + 12-hour cycle) (D)	See 5.8 of IEC 61747-10-2:2014		
C8	Electrical endurance (D)	To be specified in the detail specification		
C9	Storage (at high temperature)	See 5.4 of IEC 61747-10-2:2014		
	Storage (at low temperature)	See 5.5 of IEC 61747-10-2:2014		
C10	Low air pressure (D)	See 5.6 of IEC 61747-10-2:2014		
C11	Permanence of marking (D) (where appropriate)	See 4.1 of IEC 61747-5:1998		
C12	ESD (D)	To be specified in the detail specification		
CRRL	Attributes information for C5, C6, C7, C8, C9 and C11			

9 Qualification approval test (group D)

When required, these tests shall be prescribed in the sectional specification for qualification approval only.

10 Additional information

Refer to Annex A.

Annex A
(informative)

Additional information items

In addition to the items listed in the main body of this document, the following items should be reported in case there is any requirement from customers**:**

– pixel chart of display area,
– data input timing,
– interface timing chart,
– interface timing ratings,
– circuit block diagram,
– measuring points of luminance,
– precautions with respect to electrostatic discharge,
– precautions for installation: mechanical and/or electrical,
– supply voltages sequence condition,
– handling information,
– hazard/safety and disposal/recycling information,
– characterization of diffused and specular reflectance and transmittance.

Bibliography

CIE (1931), *Standard photometric observer*

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