

DHA 90-4104-020

Enhanced Sunlight Readable & NVIS Compatible Display Head Assembly

GENERAL SPECIFICATIONS

Display Diagonal Size	10.4" (264.16 mm)
Resolution	1024 x 768 (XGA)
Aspect Ratio	4:3
Refresh Rate	60 Hz
Contrast Ratio	1250:1
Weber Contrast	26.66:0
Display Colors	16.7 M
Color Gamut	72% NTSC
LCD Technology	Si TFT Active Matrix
Response Time (R/F)	25 ms
Horizontal Viewing Angle	±85°
Vertical Viewing Angle	±85°

ELECTRICAL SPECIFICATIONS

LCD Interface	LVDS
LCD Voltage	3.3 VDC
LCD Maximum Power	0.30 W

BACKLIGHT SPECIFICATIONS

Maximum Brightness	1950 cd/m²
Maximum Power	17.3 W
Uniformity	87.4%
LED Driver	21-360 (recommended)

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-45°C to 85°C
Storage Temperature	-55°C to 85°C

RELIABILITY

Shock	220 G, 2 ms, ½ Sine Wave
Vibration	1.5 G (10–300 Hz)

NVIS SPECIFICATIONS

MIL-STD-3009 NVIS White
MIL-STD-3009 Radiance Class B

SPECIAL FEATURES

TYPE	DESCRIPTION
Dual Mode	High brightness and NVIS-compatible backlight modes
Military Grade	Extended operating and storage temperature range 10-year production: Ideal for aerospace and defense applications requiring long product life cycle and expensive certification/re-certification Superior resistance to shock and vibration Configuration control
LCD Value-Add	All LCD value-add (excluding LCD) under General Digital's direct control, including P-Frame, LCD bezel and enclosure, light guide and optical films



The 90-4104-020 10.4" display has been optically enhanced to meet specialized needs.

Weber Contrast vs Power

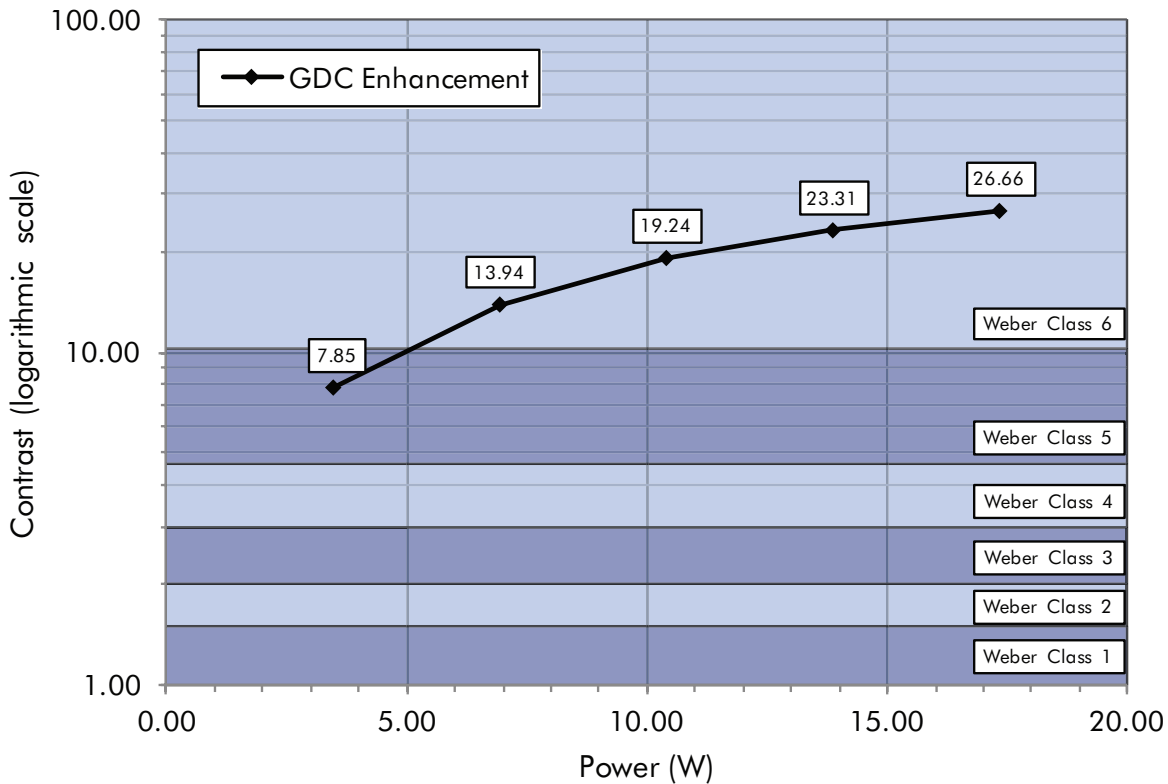


Figure 1: Weber Contrast vs Power (reference Notes 1, 3, 4 on page 3)

WHAT IS WEBER CONTRAST?

Weber contrast is an important attribute to consider when selecting a display for use in high ambient brightness environments. Unlike the standard contrast value, which is measured in ideal conditions (dark room), the Weber contrast is measured under the simulated effects of direct sunlight (10,000 fc direct and 2,000 fL Lambertian light sources). General Digital determines and records the Weber contrast using the test procedure described in MIL-L-85762A. To simplify and quantify the engineering challenge of qualifying a panel for use in high ambient brightness conditions, we created our own unique metric (Weber Class), which is derived directly from Table II of MIL-L-85762A. This data establishes that the larger the Weber Class number, the better the display will perform in high ambient brightness conditions.

WEBER CONTRAST LOOKUP CHART

DISPLAY CLASS	CONTRAST RANGE	SHORT DESCRIPTION	IDEAL APPLICATIONS
Class 1	0.00 to 1.49	Not sunlight readable	Not suitable for direct sunlight use
Class 2	1.50 to 1.99	Numeric only	Useful for numerics only in direct sunlight
Class 3	2.00 to 2.99	Alphanumeric	Useful for characters and numerical data
Class 4	3.00 to 4.659	Graphic symbols and alphanumerics	Useful for characters, numerical data and static images
Class 5	4.66 to 10.29	Acceptable video performance	Useful for characters, numerical data, static images and low quality video (6 $\sqrt{2}$ shades of gray with counting off as 1)
Class 6	10.3 and higher	Best case video performance	Useful for characters, numerical data, static images and high quality video (eight or more $\sqrt{2}$ shades of gray with counting off as 1)

Temperature & Brightness vs Power

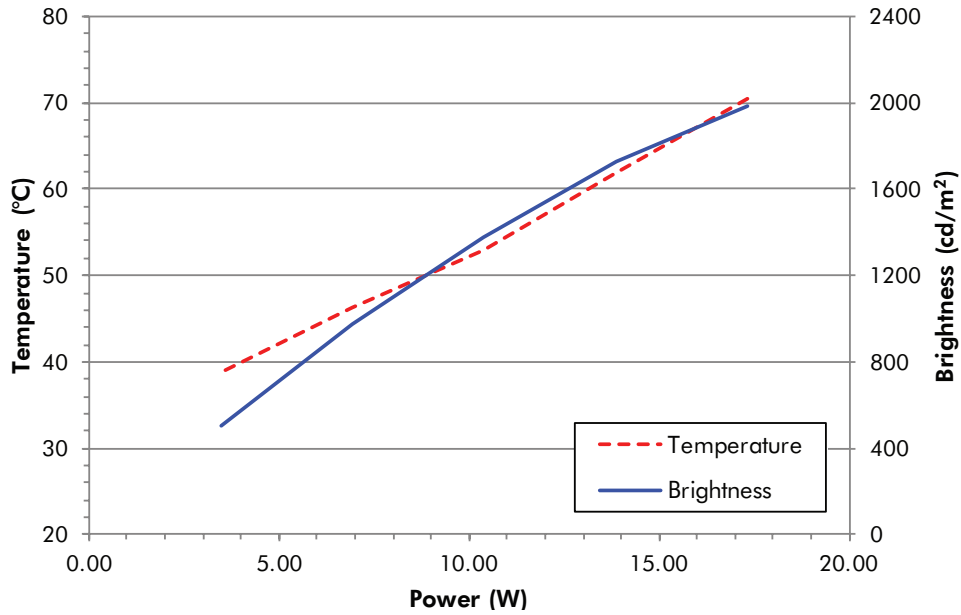


Figure 2: LCD Temperature and Brightness vs Backlight Power (reference Notes 1, 2)

CIE 1931 Color Space

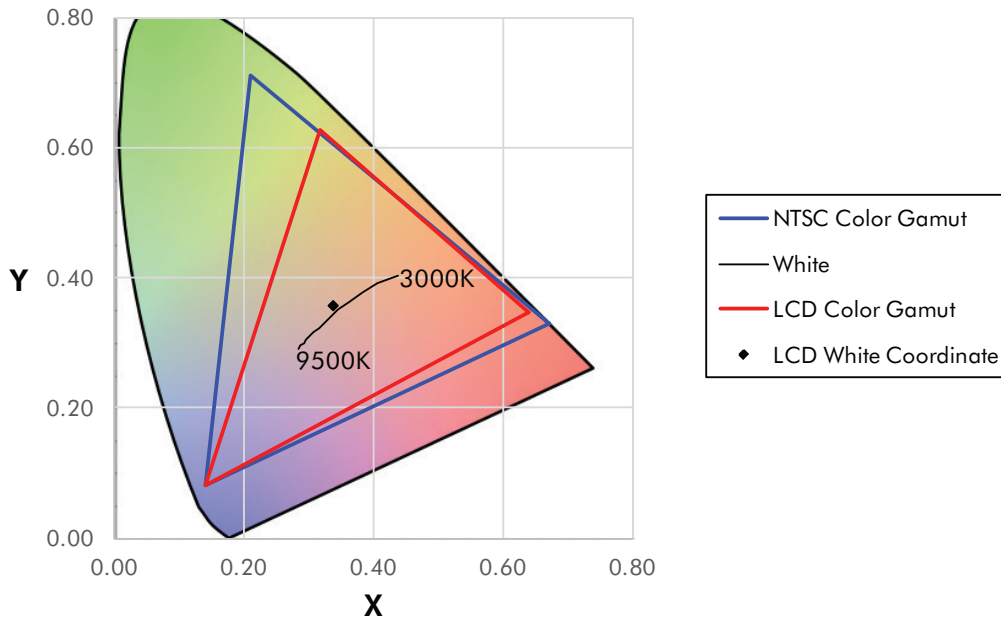


Figure 3: LCD RGB Color Coordinates Compared to NTSC Color Space (reference Notes 1, 3, 4)

NOTES

- 1) Data recorded at an ambient temperature of 25°C.
- 2) Temperature on rear panel on the center of the Day Mode LED Rail.
- 3) Weber Contrast calculated IAW MIL-L-85762A.
- 4) Measurements taken with antireflective film and ESR overlay.

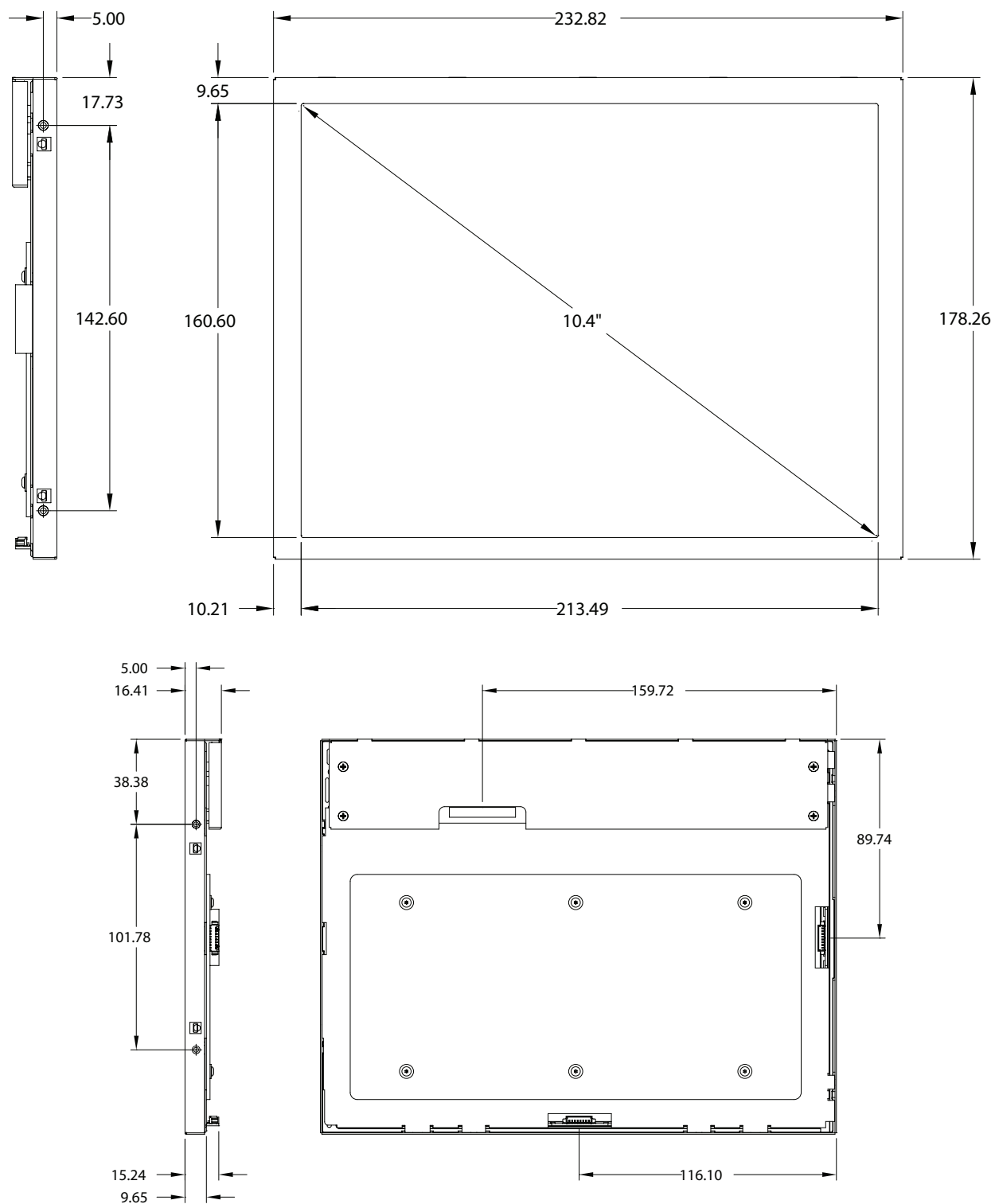


Figure 4: Display dimensions (unit of measure: mm; tolerance is ± 0.40 mm unless otherwise indicated)

MECHANICAL SPECIFICATIONS

Active Area	210.432 (W) x 157.824 (H) mm
Dimensional Outline	232.82 (W) x 178.26 (H) x 16.41 (D) mm
Weight	514 g

VALUE-ADD OPTIONS (Partial listing—contact General Digital for additional selections)

TYPE	EXAMPLES
Overlays	Touch screens, EMI filters, heaters, vandal shields, more
Overlay Integration	Optical bonding or mechanical mount
Films	AR (antireflective), AG (antiglare), AR/AG, privacy, contrast, hydrophobic, more
Controllers	Video, LED backlight, heater, touch, OSD, custom, more
Integration	Can be integrated into most General Digital standard products, or designed into custom assemblies
Software	Software/firmware development and IV&V (Independent Validation & Verification) services available

REVISION HISTORY

REV. NO.	ECN NO.	DATE	DESCRIPTION	INITIAL
0	—	5 May 2017	Created document	JDG
1	—	5 May 2020	Updated layout; added Reliability specifications	JDG



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999-4104-020r1