Industrial Electronic Engineers

Industrial Products

"Shaping the future with innovative display solutions"

INDUSTRIAL ELECTRONIC ENGINEERS

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Over 60 Years of Excellence...

For over 60 years, IEE has provided its customers with quality and value in a variety of display technologies. Providing a comprehensive offering of information displays and integrated display solutions, IEE's products are utilized in applications ranging from the factory floor to the retail store, from the battlefield to the operating room. Across a wide spectrum of commercial, industrial and military/aerospace applications, IEE continuously provides industry leading technical and manufacturing excellence in standard products and custom solutions.

IEE's products include interactive touch displays, flat panel displays, extra-wide temperature liquid crystal displays, vacuum fluorescent displays, customer Point of Sale (POS) pole displays and price verification kiosks. IEE's unique ruggedized packaging and software capabilities make us the perfect source for integrated and custom display solutions.

World-Class Manufacturing and Engineering

Located in Southern California, IEE designs and manufactures its own display modules offering the highest level of on-time delivery, product quality and overall customer satisfaction. We use the most advanced techniques in surface mount technology and full systems integration.

- State-of-the-Art Surface Mount Assembly Lines
- Computer Controlled Reflow Ovens for RoHS and non-RoHS Processes
- High Volume Production Capability
- Thru-hole and Electromechanical Assembly
- Computer Controlled Wave Soldering Systems
- High Speed, Computer Controlled Display Soldering Systems
- Automated Conformal Coating System
- KANBAN Replenishment System
- Prototyping and Turnkey Solutions
- Clean Room Area
- Environmental Screening
- Dedicated RoHs Compliant Work Cells

ISO 9001 CERTIFIED ORGANISATION

United Registrar of Systems Cert No.12047

Uncompromised Quality

Superior systems, suppliers and people create an environment of consistent, outstanding performance. IEE's commitment to customer service and satisfaction is supported through a program of training, process management, control and quality audits. IEE continuously strives for excellence in product quality, on-time delivery and efficiency.

- ISO 9001:2000 Certified Company
- Workmanship Standards: IPC-A-610 and ANSI/J-STD-001
- Total Quality Environment, SPC, Continuous Improvement
- Certifications: NRTL, UL, FCC, uTUVus, CSA and CE

TFT Display Enhancement

IEE can design and produce equipment to your specification using virtually any combination of flat panel display, interface controller, touch screen, backlight, inverter, power supply and mechanical packaging. IEE will assist you in choosing the correct display technology to meet your system requirements.

IEE provides fully integrated LCD flat panel display solutions from concept to production. IEE focuses on all facets of production including materials, assembly, test, engineering and project administration. Our dedicated, in-house team of engineers are experts in the design and manufacturing process. Their experience and in-depth knowledge is applied to a wide variety of product applications and markets.

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Display Integration Capabilities

Brightness Enhancement:

- Multi-lamp inverter
- Direct backlighting
- Polarizer upgrade
- Optical film enhancement (passive)
- Brightness up to 3,000 NIT
- LED backlight (replace existing CCFL)
- NVIS compatibility

Filters:

- Anti-glare
- Anti-reflective
- Vandal resistant protection
- EMI
- Contrast enhancement

Touch Screen Integration:

- Resistive (digital and analog)
- Capacitive
- Projected capacitive
- IR

Display Controllers:

- Analog RGB
- Video
- USB

Ruggedization:

- Extended operating temperature
- Vibration and shock
- Moisture and dust
- Altitude
- Replace CCFL with LED

Bezels & Housing:

- Metal (machined or cast)
- Plastic
- Open frame or complete enclosures
- Custom mounting options
- Custom enclosures to NEMA requirements available

Sample Configurations

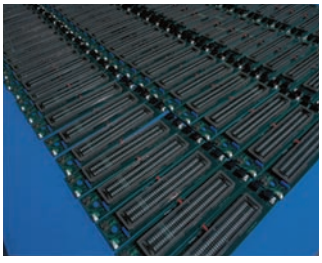
6.4" open frame display, high bright, sunlight readable with heater and video interface for outdoor banking application

6.4" display, resistive touch screen, high bright, sunlight readable, moisture sealed transportation communication panel, ruggedized to SAE specifications

12.1" open frame display with video controller and custom bracketry for rugged industrial application

Vacuum Fluorescent Display Modules

The unbeatable combination of outstanding appearance, ease of use, and a wide range of character formats has made IEE's vacuum fluorescent (VF) display modules the choice in a variety of industrial, medical, test equipment and retail applications.



IEE is the largest U.S. manufacturer of vacuum fluorescent displays

Display fields range from 20 to 240 bright, easy to read characters. The display color is blue-green which is easily filtered to several alternative colors. IEE's VF product family includes low cost ("no-frills") and full featured dot matrix displays that are industrial strength and ruggedized. Most are available with extended operating temperatures and an array of enhanced features such as expanded character sets and downloadable fonts.

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VF Module Key Features

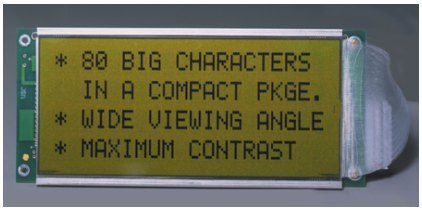
- On-Board serial and parallel interface
- USB modules available
- Interface to Intel or Motorola host processors
- Low power consumption
- 100% surface mount technology
- Wide temperature range and conformal coated modules
- Low cost and compact package modules
- RoHs Compliant modules

VF Module Part Numbers

Listed is IEE's most popular modules in the Century and low-cost (No-Frills) product lines. Other module sizes and features are available including wide temperature and formal coated models. Contact factory for other available modules.

Part Number	Character Format	Character Height	Dimensions (LxWxD)	Max. Current
Century Series				
03603-100-05420	4x20	5mm	5.00" x 2.78" x 0.92"	890mA
03603-105-05220	2x20	5mm	5.00" x 2.25" x 0.88"	510mA
03603-122-09220	2x20	9mm	7.75" x 2.58" x 1.00"	675mA
03603-124-09420	4x20	9mm	7.75" x 3.40" x 1.00"	1300mA
03603-151-05240	2x40	5mm	9.50" x 2.05" x 1.00"	800mA
Low-Cost (No-Frills) Series				
03601-26A-240R	6x40	5mm	10.50" x 4.17" x 1.66"	1700mA
03601-90-080R	4x20	5mm	5.51" x 2.44" x 1.21"	450mA
03601-95B-40	2x20	5mm	5.00" x 2.25" x 0.94"	460mA
03601-96-080R	2x40	5mm	7.85" x 2.03" x 0.94"	750mA

Liquid Crystal Display Modules



IEE's Daystar Nova series of liquid crystal display (LCD) modules utilize super bi-refringent effect technology that provides maximum contrast at very wide viewing angles.

The modules feature 4 lines of 20 and 4 lines of 40 blue-black characters on a golden-green background with a library of 197 alphanumeric, symbols and user-defined characters. The serial input option provides an added set of 206 characters, downloadable eight at a time. Four backlighting illumination options are available: electroluminescent (EL) for operation in very low ambient light; prism focused LEDs for three colors of backlighting in very low ambient light; white fiber optics for uniform long life backlighting in low ambient light; or reflective only when ambient light is adequate.

All displays have microcontrollers that support the 4- or 8-bit parallel interface with an optional on-board interface controller to support an EIA-232 serial input. All timing, refresh and display functions are controlled by the modules and backlighting power is supplied by the host system on a separate connection.

LCD Module Key Features

- Super Bi-refringent Effect (SBE) liquid crystal cell
- Four backlight options: EL, LED, fiber optic, reflective only
- Low 5Vdc power
- Wide temperature range
- Remote operations up to 50 feet with serial data input option
- Built-in temperature compensation

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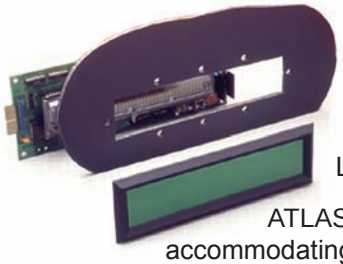
LCD Module Part Numbers

IEE also has photolith versions of Daystar Nova modules available in various line formats with two backlight options: reflective only and electroluminescent. Contact factory for part numbers.

Part Number	Character Format	Character Height	Data Input	Backlight	Operating Voltage
03805-06-0100, -0200	4x20	12mm	parallel, serial	reflective only	5Vdc
03805-21-0100, -0200	4x40	10.4mm	parallel, serial	reflective only	5Vdc
03858-06-0105, -0205	4x20	12mm	parallel, serial	EL	5Vdc
03858-21-0105, -0205	4x40	10.4mm	parallel, serial	EL	5Vdc
03865-06-0111, -0112, -0113	4x20	12mm	parallel	LED -red, green, yellow	5Vdc
03865-06-0121, -0122, -0123	4x20	12mm	parallel	LED -red, green, yellow	12Vdc
03865-06-0211, -0212, -0213	4x20	12mm	serial	LED -red, green, yellow	5Vdc
03865-06-0221, -0222, -0223	4x20	12mm	serial	LED -red, green, yellow	12Vdc
03875-06-0114, -0214	4x20	12mm	parallel, serial	fiber optic	5Vdc
03875-21-0114, -0214	4x40	10.4mm	parallel, serial	fiber optic	5Vdc



Display Mounting Hardware

IEE offers both ATLAS™ and ATLAS 2™ Bezel/Filter Display Mounting Systems for LED, LCD, and VF Displays.

ATLAS™ mounting hardware consists of a single piece, molded frame construction bezel accommodating LED, LCD and incandescent displays in widths up to eight digits. Each is fitted with colored filter or clear viewing screens. Mounting rails, sockets and several decoder/driver assemblies are available.

ATLAS 2™ universal sealed bezel system has a full range of bezel sizes fitting popular display formats with custom designs available. A variety of filter colors are available. Each bezel system has threaded inserts on the rear surface of the bezel and are available in both standard U.S. and metric versions simplifying attachment to the customer's front panel.

Contact factory or visit IEE's website for the full range of low cost, pre-assembled sealed bezel/filter systems.

Touch Entry Displays and Interactive Mini-Terminals

IEE's Peripheral Entry Panel (PEP) is an interactive terminal assembly integrating a 6-line, 40-character display module with an infrared switch matrix. Interaction with the host system occurs when the operator reads displayed messages and responds by breaking the IR beams with a touch at the switch location on the screen. The PEP is intended to be mounted to a cutout in the user's panel. The single piece, molded poly carbonate bezel includes an O-ring gasket which facilitates drip-proofing.

V.I.P. mini-terminals combine a VF display module with a sealed front panel keypad. Switch legends and front panel appearance are easily customized. Front-mount or rear-mount models are available. The V.I.P.'s front panel is shielded from electrostatic discharge (ESD) and is drip proof. Rear mount V.I.P.'s maybe be sealed to the host front panel with a gasket to meet NEMA 12 standards. The membrane keypad includes metal domes for positive aural and tactile feedback.

Custom Capabilities

Over 60 years in the display and front panel business brings the experience necessary to accommodate unique applications and custom design requirements.

Custom display assembly using OLED technology

IEE's custom designs include front panels with display and keypads for military radios; VF and OLED displays with custom bezels; and custom hand-held control/display units for military and rugged industrial applications.

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VF Part Number Scheme
Century Series

036X3 - 1XX - XX X XX

- 036 — Denotes dot matrix display format
- X — Performance Options
  - 0 = Standard temperature range
  - 1 = Wide temperature range
  - 2 = Standard temperature range with conformal coating
  - 3 = Wide temperature range with conformal coating
- 3 — Century Series designator
- 1XX — Model number
- XX — Approximate character height (mm)
- X — Number of character lines (rows)
- XX — Number of characters per line (columns)

Accessories:

	Part Number
Century Series	
Cable assembly, single-ended	35406-XX*
Cable assembly, double-ended	35407-XX*
No-Frills Series**	
Serial data convert module (NF/SDCM)	31785-22
Power/data connector with cable (models 03601-90 & 96)	32770-XX*
Dual-ended power/data cable/connector (models 03601-90 & 96)	32771-XX*

*Available in 18” and 36” lengths
**Contact factory for wide temperature models

LCD Part Number Scheme
Daystar Nova Series

038XX - XX - 0XXX

- 038 — Model Designator
  - 8 = LCD technology
- XX — Backlight Options
  - 05 = No backlight
  - 58 = Electroluminescent (EL)
  - 65 = Light Emitting Diode (LED)
  - 75 = Fiber Optic (FO)
- XX — Model Number
  - 06 = 4 rows x 20 characters/row
  - 21 = 4 rows x 40 characters/row
- 0XXX — Backlight Characteristics
  - **3858 Models:**
  - 0X = Backlight uses external power
  - X5 = Aviation green EL color
  - **3865-06 Models (only):**
  - 1X = 5Vdc backlight power
  - 2X = 12Vdc backlight power
  - X1 = Red LED color
  - X2 = Green LED color
  - X3 = Yellow LED color
  - **3875 Models:**
  - 1X = 5Vdc backlight power
  - X4 = White FO color
- 0XXX — Interface Options
  - 01 = Parallel
  - 02 = EIA-232 serial

Accessories:

	Part Number
Single-ended power/data cable with connector (keyed)	30554-XX*
Power/data connector only (keyed)	30554-99
Dual-ended power/data cable with connectors (keyed)	30553-XX
EL backlight inverter for 3858-06 models	46013-01
EL backlight inverter for 3858-21 models	46320-01

*Available in 18” and 36” lengths

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Vacuum Fluorescent Display Module Specifications

Display Characteristics:

Character format:	5x7 dot matrix
Character height:	5mm or 9mm
Display color:	Blue-green, peak @ 5,000A
Brightness level:	100fl min./200fl typ. (full bright)
Viewing angle:	150° cone
Tube life:	40,000 to 100,000 (no fixed message)

Data Interface:

Parallel data input:	8 bit (Intel or Motorola)
Serial data input*:	EIA-232C, baud rate to 19.2Kb
I/O hardware lines:	reset, busy, dimming and bell alarm output
I/O connector:	power and data, single connector

*Optional serial data converter module available on "No-Frills" Series

Parallel Interface Requirements:

Century Series

Input levels:	high ≥ 3.5Vdc @ 5.0µA max. low ≤ 1.5Vdc @ 0.5mA max.
Output levels:	high ≥ 4.6Vdc @ 5.0mA max. low ≤ 0.4Vdc @ 5.0mA max.
Pull-ups:	parallel I/O lines are pulled up to +5Vdc by internal 10kΩ resistors

"No-Frills" Series

Input levels:	high ≥ 2.4Vdc @ 1.0µA max. low ≤ 0.5Vdc @ 1.6mA max.
Output levels:	high ≥ 3.5Vdc @ 150µA max. low ≤ 0.5Vdc @ 4.0mA max.
Pull-ups:	parallel I/O lines are pulled up to +5Vdc by internal 10kΩ resistors

Serial Interface Requirements:

Century Series

Input levels:	high +3 to +15 volts (space/logic 0) low -3 to -15 volts (mark/logic 1) conforms to EIA-232 specification
Baud rate selectable:	1200, 9600, or 19200 (maximum available baud rate depends on execution times)
Data word:	10 bits (8 data bits with start bit and 1 stop bit)
Parity:	none

Power Input Requirements:

Power:	ON/OFF sequence*
Supply voltage:	5.0 ± .25Vdc
Supply current:	265mA to 1300mA (display module dependent)
Supply rise time:	100 milliseconds max.

*Rapid power sequencing is not recommended. The power/data cable should not be connected/disconnected while power is applied.

Note: Detailed specifications on IEE's VF and LCD modules can be downloaded from our web site www.ieeinc.com

Environmental Characteristics:

Century Series

Standard operating temperature:	-20°C to +70°C
Extended operating temperature:	-40°C to +85°C
Storage temperature:	-50°C to +85°C
Relative humidity:	0 to 90% (non-condensing)
Vibration:	10 to 50Hz, 2mm peak-to-peak (any axis)
Shock:	20g (any axis)

"No-Frills" Series

Standard operating temperature:	0 to +55°C
Extended operating temperature:	-40°C to +85°C (optional)
Storage temperature:	-50°C to +85°C
Relative humidity:	0 to 95% (non-condensing)
Vibration:	10 to 50Hz, 2mm peak-to-peak (3-axis)
Shock:	40g (3-axis) 9mS

Software Control Features:

Selectable character sets**	Screen saver mode**
Downloadable characters	Blank display screen
Vertical scroll mode	Bell alarm output**
Horizontal scroll mode	Read back data
Set brightness levels	Erase line data
Column brightness**	Cursor locate
Set blink field and rate**	Software reset
Execute self-test	

Character Set Features:

Primary:	96 character ASCII, 10 user defined characters*
Embedded:	European (default), Katakana, Cyrillic, Hebrew**

* 90 Series "No-Frills" have 3 user defined characters

** Century Series only

Optional Filter Colors:

Neutral gray, blue, aqua, yellow, green, yellow (circular polarizer)

Note: Yellow is often used in low-light applications and may appear neon-orange in color.

Regulatory:

UL (U.S. and Canada), CE, FCC, CSA (U.S. and Canada), RoHS compliant

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Liquid Crystal Display Module Specifications

Display Characteristics:

Format:

38xx-06	4 lines x 20 characters
38xx-21	4 lines x 40 characters

Character field:

5x7 dot matrix (upper/lower case, multi-language)

Character height:

with cursor:

38xx-06	.48 in. (12.1mm)
38xx-21	.41 in. (10.4mm)

without cursor:

38xx-06	.39 in. (9.09mm)
38xx-21	.34 in. (8.64mm)

Character width:

38xx-06	.24 in. (6.1mm)
38xx-21	.20 in. (5.0mm)

Overall active area:

38xx-06	5.70 in. x 2.34 in. (144.9mm x 59.5mm)
38xx-21	9.97 in. x 2.03 in. (248.7mm x 51.5mm)

Viewing mode:

light field reflective or light field transflective (for backlit models)

Viewing angle*:

Vertical:	+50° to -70° (typ)
Horizontal:	±45° (min)

Contrast ratio:** 10 (min)

Response time:**

On	25°C-100 ms (typ), 150 ms (max), -30°C -2000 ms (typ)
Off	25°C-150 ms (typ), 200 ms (max), -30°C -4000 ms (typ)

Luminance:

3805-06,-21	Ambient light dependent
3858-06,-21	1 ft-L (typ), varies with V&f (BL)
3865-06-0xx1	1.2 ft-L (typ), red
3865-06-0xx2	0.6 ft-L (typ), green
3865-06-0xx3	0.9 ft-L (typ), yellow
3875-06,-21	3-4.5 ft-L, varies with type of light source

* Measured at peak vertical angle, Ø = +10° above normal plane

**Measured at peak viewing angles

Serial Input Characteristics:

Format:	**Input only:**
Data	7 or 8 bits
Parity	odd, even or none
Baud rates	1200, 2400, 4800 or 9600

Electrical Characteristics:

Power supply voltage:

(Vcc) ±5 ±10%Vdc

(Vcc) -0.3 to +6.5 Vdc (max)

Power supply current:

38xx-06-01xx	15mA (max)
38xx-21-01xx	20mA (max)
38xx-06-02xx	35mA (max)
38xx-21-02xx	40mA (max)

Logic levels:

Input levels	logic 1 ≥ 2.2Vdc
	logic 0 ≤ 0.6Vdc
	-0.3 to Vcc +0.3Vdc (max
Output levels (TTL)	logic 1 ≥ 2.4Vdc @ 0.20mA
	logic 0 ≤ 0.4Vdc @ 1.2mA

Input leakage current: 0.001mA (max)

Serial input levels

Space (high)	3.0Vdc (min) to +25Vdc
Mark (low)	-25Vdc to 0.8Vdc (max)
(max)	-25.0 to +25.0Vdc

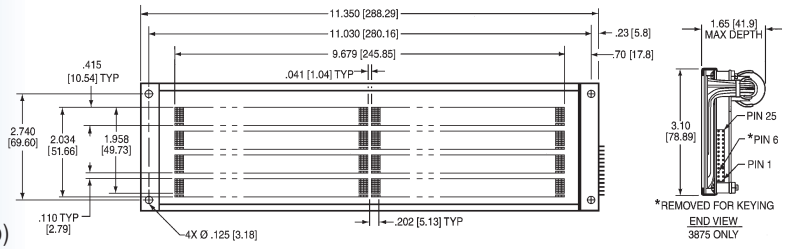
Electrical Characteristics (Cont'd):

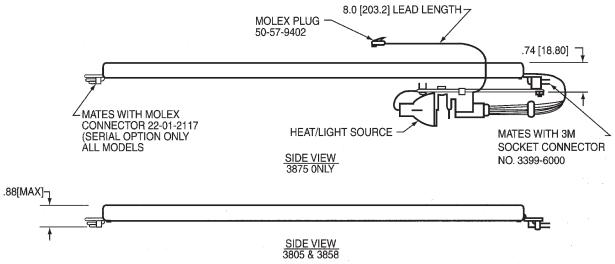
Backlight current:

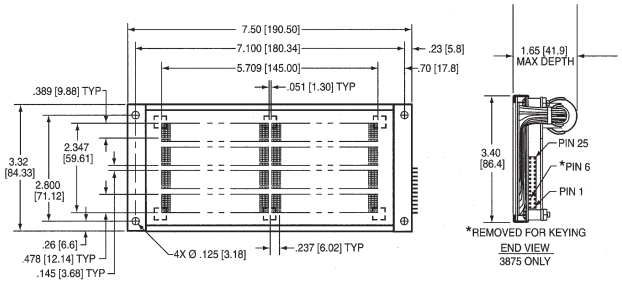
3858-06-0x05	120mA @ V_{BL} = 5.0Vac, 330Hz
3858-21-0x05	180mA @ V_{BL} = 5.0Vac, 330Hz
3865-06-0x01	400mA @ V_{BL} = 5.0Vdc
3865-06-0x2x	200mA @ V_{BL} = 12.0Vdc
3875-06-0x14	.97A @ V_{BL} = 5.0Vdc
3875-21-0x14	.97A @ V_{BL} = 5.0Vdc

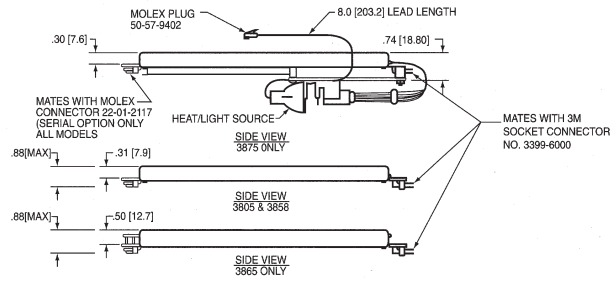
Environmental Characteristics:

Operating temperature:	-30 to +80°C (without backlight)
Storage temperature:	-40 to +85°C
Relative humidity:	
≤+40° C	95% RH (non-condensing)
≥+40° C	absolute humidity must be lower than the humidity of 95%RH at +40°C
Vibration (operating):	10G
Shock (operating):	10G









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