

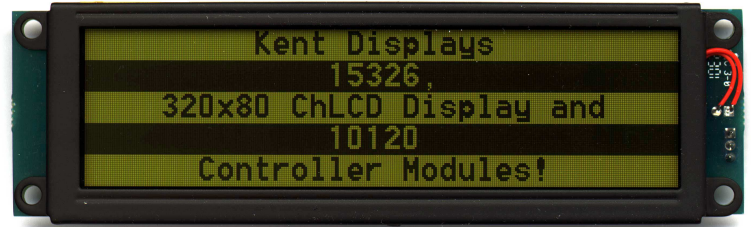
Typical Applications

- Battery Powered, Portable Displays
- Man-Machine Interface (MMI) Displays
- General Purpose Indoor or Outdoor Signage
- Point of Sale Displays
- Instrumentation or Avionic Displays
- Remote Control Display Applications

Product Description

The Kent Displays 320x80 Displays are modular units designed for general-purpose graphic and character display applications. Intended uses include instrumentation, point of sale and other general-purpose indoor/outdoor hand held display applications.

As with all Kent Display cholesteric (ChLCD) products, the 320x80 modules contains the same optical and power saving advantages over traditional LCD products. After an image is generated on the module, it will remain indefinitely after power is removed, or until a new image is generated.



320x80 Display Module with Heater Option

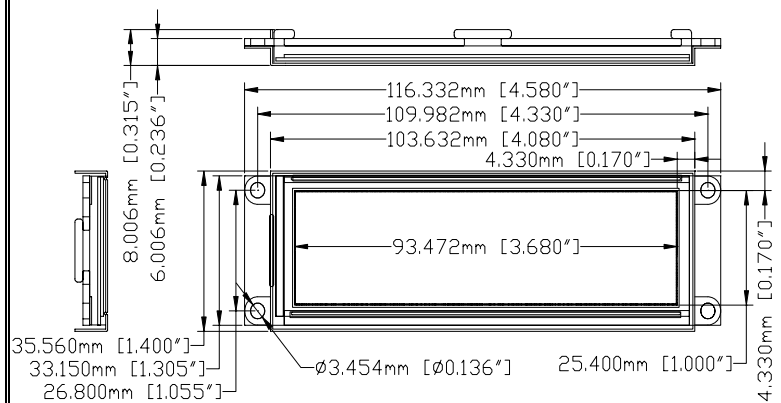
Standard Display Only Features:

- 320 by 80 Pixels, 3.8" Diagonal, 83 DPI image.
- Battery powered capability (3-9 VDC).
- Graphic or character generation capability.
- Full or Partial Screen Update Capability
- **Dynamic Update Capability, including:**
Wipe, Scroll, Rotate, Open, Close, Flashing, Swell and Fade.
- Available with heater option, to maximize update speed at low operating temperatures
- Indefinite image memory capability.
- 360 degree unlimited viewing angle.
- Superior brightness & optical characteristics

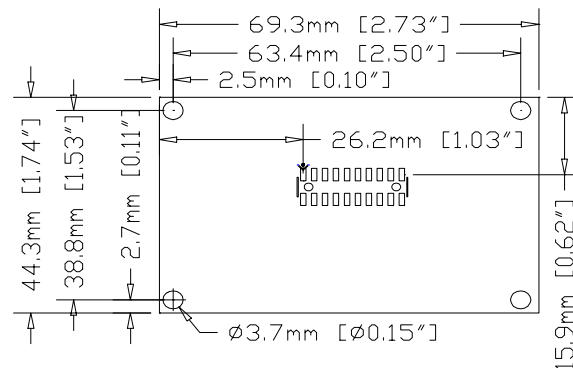
Display w/Optional Controller Features:

- Up to 31 controllers can be controlled from a host computer (Unique Address capability).
- Battery powered capability (3-9 VDC Input).
- Automatic Wake/Idle & Sleep mode capability.
- Local diagnostics and control.
- *Stores up to 79 unique messages per display.
- 40, 160, 320 or 530 Characters/Display w/ Text Generator.
- 6 unique fonts, and font controls w/ Text Generator.
- Automatic message generation capability.
- RS-232, RS-485, TTL and/or RF "wireless" interface.
- 320x80Soft, Windows-Based Software supplied with product, provides the following features:
Full Text and Graphical Editor.
Scheduler.
Message/ Image Storage & Retrieval.

* Based on controller module, storing full screen text messages



320x80 Display Mechanical Dimensions



320x80 Controller (10120) Mechanical Dimensions

Kent Displays Inc
343 Portage Blvd.
Kent, OH 44240, USA

Tel (330) 673 8784
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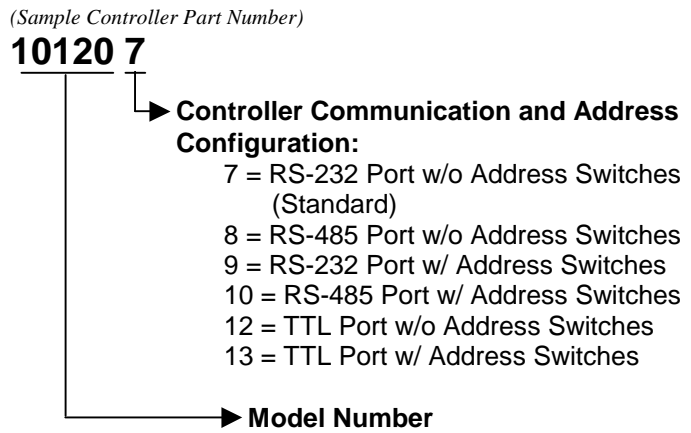
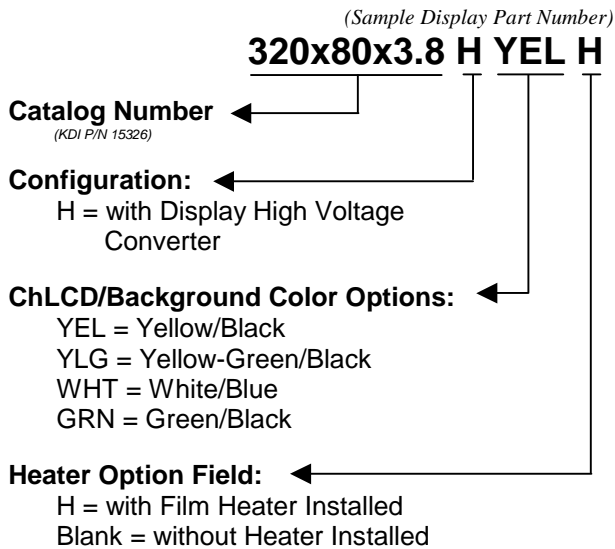
Product Ordering Information:

See detailed Ordering Information & list on next sheet.

320x80x3.8

320x80 Cholesteric Display Modules, with Dynamic Update Capability

320x80 Product Ordering Information:



(Sample 320x80 Product Development Kit)

90023-YLG

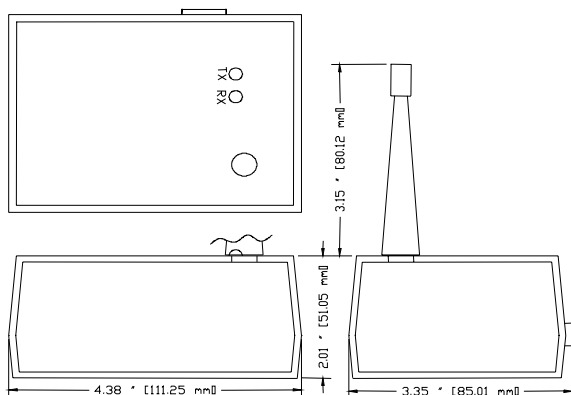
(RF Slave Module Part Number)

10158

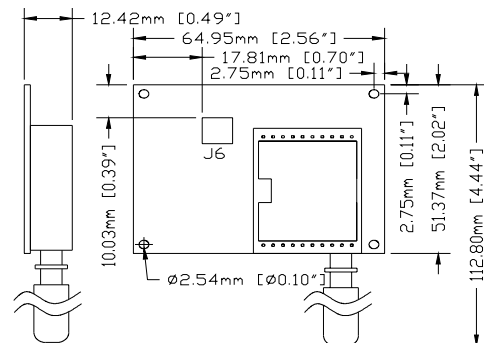
(RF Host Box Part Number)

10146

Typical 320x80 Module and Related Product Ordering Examples:	
320x80x3.8-H-YLG	320x80 Yellow-Green/Black Display Module, without Film Heater Installed
320x80x3.8-H-WHT-H	320x80 White/Blue Display Module, with Heater Installed
10120-7	Standard 320x80 Controller Module, with RS-232 and RF Ports, and without address switches
90023-YEL	320x80 Product Development Kit with Yellow/Black Display (1 display, controller, software, COMM & power cables, display to Controller interconnects, documentation and technical support are provided).
10158	RF Slave Transceiver Module (1 required per controller location)
10146	RF Host Transceiver Box Assembly (1 required per Host Computer System)



10146 RF Host Transceiver Mechanical Drawing



10158 RF Slave Mechanical Drawing

320x80x3.8

320x80 Cholesteric Display Modules, with Dynamic Update Capability

General Specifications – 320x80x3.8 Display Modules

Parameter	Value/Description	Units
Display Panel Resolution and Format	Cholesteric reflective LCD (ChLCD) material with contrasting color background, 80 rows by 320 columns.	
Pixel Pitch	83.4 dots per inch (Avg.), or 0.2922 (X Axis)/0.3179 (Y) between pixel center-lines.	mm
Pixel Size	0.2622 x 0.2879 mm	mm
ChLCD Image Area Dimensions	93.472 x 25.4 (96.86 mm, or 3.81" diagonal)	mm
Display Viewing Area Dimensions	95.97 x 28.15	mm
Bezel Outside Dimensions	103.632 x 35.56	mm
Display Module Weight	1.6 (45.3 grams)	oz
*Operating Temperature Range	-20 to 80	C ⁰
**Image Clearing Temperature All Display Configurations	≈90-95	C ⁰
Storage Temperature Range	-40 to +100**	C ⁰
Illumination Source	None (reflective technology).	
Full Image Update Rate: Typical all module types	Less than 0.5 (@ 23.5 C ⁰ , Refer to on last sheets of this document)	Sec.
UV Protection Recommendations	98% blocking of 380 nm and lower spectral components is recommended	
Recommended Transparent Plastic Display Cover	Acrylite OP-3-P-99, matte finish, with UV blocker, or equivalent	
Recommended Mating Connector Socket	2 mm pitched, 2x10 or 20 conductor Socketed Header, KDI P/N 4349, Samtec P/N TLE-110-01-G-DV	

*. Displays and controllers have been tested to operate beyond 0-70 C⁰, however display electronics can only be guaranteed between 0 and 70 C⁰. Image quality may degrade at temperatures above 58 C⁰.

** Display will not retain image if the display temperature is greater than specified clearing temperature.

Electrical Characteristics – 320x80x3.8 Display Modules

Parameter	Min.	Typ.	Max.	Units	Condition
Logic Power Source Voltage (V _{CC})	4.75	5.0	5.25	VDC	T = 25 C ⁰
Power Source Voltage (V _{DD})	2.8	3.0	10	VDC	T = 25 C ⁰
High Level Logic Input Voltage (V _{IH})	4.75			VDC	
Low Level Input Voltage (V _{IL})			0.8	VDC	
*Average Operating Power, Enabled Active (P _{EA})		60		mW	While Driving Image, in Conv. Drive Mode, T= 25 C ⁰ , V _{DD} =6V
*Average Operating Power, Enabled Active (P _{EA})		30		mW	While Driving Image, in Conv. Drive Mode, T= 25 C ⁰ , V _{DD} =3V
*Average Operating Power, Enabled Active (P _{EA})		66		mW	While Driving Image, in Dyn. Update Mode, T= 25 C ⁰ , V _{DD} =6V
*Average Operating Power, Enabled Active (P _{EA})		45		mW	While Driving Image, in Dyn. Update Mode, T= 25 C ⁰ , V _{DD} =3V
**Average Power, Not Enabled, Maintaining Image (P _{NE})			600	μW	EN_PWR = Low, V _{DD} =6V, V _{CC} =5V
Power w/ Display Disconnected & Maintaining Image			0	μW	V _{DD} & V _{CC} removed from display.

* Indicates power draw from V_{DD} while the display is updating (EN_PWR & ENABLE active). . Max power output is during brief bulk erase (~62 ms @ 25 C⁰)

** Indicates power draw from V_{DD} & V_{CC} while the display is not updating & EN_PWR inactive, for Modules w/15329 Rev. C artwork, or later.

Note: All measurements taken with DMM, with display and 10120-7 controller combination.

320x80 Cholesteric Display Modules, with Dynamic Update Capability

Interface Connections – 320x80x3.8 Display Module (J1)

Pin #	Symbol	I/O	Description
1	Batt (V _{DD})	Pwr	Positive Power Source Termination (Battery or system power input). Must be greater than 2.8 VDC for proper operation.
2	GND	Pwr	Ground Return Termination Point
*3	EN_PWR	I	Enable Module Power. Used to turn on/off the display (positive logic level input).
4	D0/ ROW_DATA	I	Data element 0 of module data bus, Row Data Input.
6	D1	I	Data element 1 of module data bus.
8	D2	I	Data element 2 of module data bus.
10	D3	I	Data element 3 of module data bus.
12	D4	I	Data element 4 of module data bus.
14	D5	I	Data element 5 of module data bus.
16	D6	I	Data element 6 of module data bus.
18	D7	I	Data element 7 of module data bus.
5	ENABLE	I	Enable. When disabled (low), all voltage outputs to ChLCD are removed.
7	LATCH	I	Latch. Used to present column image data to ChLCD material, and to zero the column data pointer (triggered at trailing edge).
9	PHASE	I	Phase or Framing. Dictates polarity and frequency of wave form to ChLCD material
11	RCLK	I	Row Clock. Used to clock data present on the row data input, D0 (triggered at trailing edge).
13	C_CLK	I	Column Clock. Used to clock data present on the 8-bit data bus interface (triggered at trailing edge).
15	T_ERASE	I	Transparent Erase. Used to increase image contrast during a transparent erase process.
19	V _{CC}	I	+5V Logic Power Input for Display.
20	TEMP	O	Temperature output of ChLCD material. Analog signal representative of ChLCD temperature.
17	N/C	-	No Connect

Notes: 1. All logic inputs to the device (Except EN_PWR) are required to be 0 to 5V levels.
 *2. EN_PWR should not be level shifted, and needs only to be greater than 2.2 volts to be activated.

Optional Heater Interface Connections – 320x80x3.8 Display Module (J2)

Pin #	Symbol	I/O	Description
1	Heater_GND	Pwr	Ground Return Termination Point for Heater Circuit (Isolated from GND termination of J1).
2	Batt	Pwr	Positive Power Source Termination (Battery or system power input).
*3	Heater_Con	I	Enable Module Power. Used to turn on/off the display (positive logic level input).

Notes: * Heater_Con should not be level shifted, and only needs to be greater than 1.5 volts to be activated.

The electrical/electronic interface for the display unit conforms to the pin-out configuration outlined in J1 table above. The display J1 header is a 2.0 mm pitched, dual row male header. Kent Displays suggests using a standard 2x10, 20 terminal 2 mm pitched socket plug (or header), Samtec P/N TLE-110-01-G-DV, or equivalent header as an interface connection. The male J1 header installed on the display module is a Samtec P/N TMM-110-01-G-D-SM-A. The mitered corner or dot on the module PCB silkscreen marks pin # 1 on the "J1" header.

For certain display types, the display module can be configured with a film heater installed mechanically and thermally to the back of the display glass cell. Applying DC power to the power pins to the heater connector interface, J2, and applying a corresponding pulse width modulated (PWM) control signal to the heater control pin (Heater_Con) will activate the heater (if installed). The Heater_Con signal should not be continuously activated. The Heater_Con PWM frequency should not exceed a few 100 kilohertz.

Activation of the Heater_Con control signal should be used in conjunction with feedback provided by the TEMP pin from the main interface header (J1-20). After enough heat is applied to the display (as indicated by the temperature reading provided by the TEMP output) for the corresponding application, the Heater_Con control signal should be de-activated.

The J2 Auxiliary heater interface connector is a standard 3 pin, 2mm pitched male header.

Detailed Product Description

The 320x80x3.8 display modules are designed to be used with the 10120-controller module for single display panel applications. The 10120 controller module can be electrically and mechanically mounted directly behind the display, or at a separate location using a 20 conductor ribbon cable assembly. Presently, a single 10120 controller can drive up to a single display module. The product is also available with RF communication option, to enable wireless communication within a given proximity (within 100' typical in a indoor office building environment).

The Kent Displays 320x80x3.8 Displays are modular units designed for general-purpose graphic and character display applications. Intended uses include instrumentation, point of sale and other general-purpose indoor/outdoor hand held display applications.

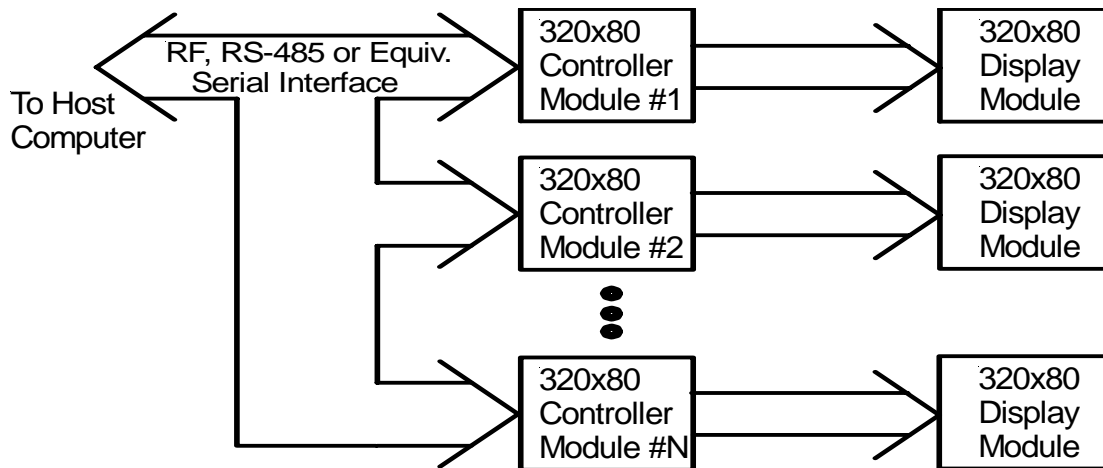
As with all Kent Display cholesteric (ChLCD) products, the 320x80 modules contains the same optical and power saving advantages over traditional LCD products. After an image is generated on the module, it will remain indefinitely after power is removed, or until a new image is generated. The display does not require "power consuming" update signals to retain the image as with traditional LCD technologies.

320x80 Cholesteric Display Modules, with Dynamic Update Capability

Furthermore, since the technology is completely reflective, no “power robbing” backlight is required to generate a high quality image. The memory and reflective features enable the display to be very energy efficient, enabling battery operation.

Since a ChLCD does not reflect polarized light, it exhibits a much wider viewing angle over traditional LCD technologies. Its extremely high contrast characteristics are exhibited consistently at viewing angles up to 90° from perpendicular to the display in all directions. The display also exhibits excellent sunlight readability characteristics. The ChLCD technology has superior contrast characteristics than typical LCD display technologies.

The 320x80 display and 10120 Controller modules configured as indicated in Application Block Diagram will contain the following features:



Notes: N <= 31

320x80 Display w/Controller Module to Host Computer Application Block Diagram

- A full duplex asynchronous **RS-232, TTL**, half-duplex **RS-485**, or half-duplex **RF wireless serial interface** can be used to communicate between the host computer and the controller modules. The standard module protocol will support full duplex, half-duplex or simplex operations. Each module is assigned a unique address for multi-drop applications by selecting the module switch setting. 31 unique address selections are possible. Controller modules without the address switches are configured to address #1. Un-addressed modules will ignore the host commands. Broadcast messages are also supported (broadcast messages are assigned address number 0). The module communicates at a standard data rate of 19.2k baud. Other data rates, such as 38.4k, 9600 or other baud rates can be configured per request.
- **Character and graphical interface capability.** Full or partial panel graphic or text images can be generated on a given display panel. The standard Kent Displays serial protocol supports all full or partial display graphical and text generation operational modes described. The host computer can change a display image by outputting an ASCII character sequence, or graphic pixel data to the corresponding controller module. The protocol is designed to minimize the communication packet lengths, enable error checking, support multiple address locations, and provide wake-up commands to support a typical “hard wired” configuration (RS-232 or RS-485 format) or an unlicensed wireless RF communication link. Refer to Kent Displays document 25016 for a detailed communication protocol description.
- The 320x80 modules have the capability to output text and graphic images in **Dynamic Update mode**. This mode of operation provides the user with the following update features:
 - a. Scroll On, Scroll OFF
 - b. Wipe ON, Wipe OFF
 - c. Open ON, Open OFF
 - d. Close ON, Close OFF
 - e. Rotate ON
 - f. Flashing, Fade and Swell

Updating display sections in this mode provides an **animation sequence**, allowing the user to **view multiple frames of data in a moving sequence**. The most common application for this type of update method is to display numbers entered on a keypad in a scrolling fashion, frame by frame as the numbers are entered. Different “ON” and “OFF” presentation methods are also possible using the controller protocol and 320x80 Interface software provided with the products. The user simply has to enter the text, or draw the graphic image (Using the 320x80 Interface Graphic editor) to output in the static frame, and the 320x80 controller will create the frame sequences automatically for the user! The user can also **make the image section larger** (for instance, a 10 row font can be output using 20, 30, ... 80 rows of the display, essentially “**Stretching**” the image vertically.) by selecting the corresponding height

320x80 Cholesteric Display Modules, with Dynamic Update Capability

adjustment feature on the user interface software. For static or single frames of data, the user can also “stretch” the image horizontally by “2x” using the software horizontal stretch option. This feature will limit image distortion when the characters are also stretched vertically using the “2x – 8x” feature described previously. Parameters on flashing images, such as the Invert and non-invert image duration’s, and the number flashes for the respective display image can also be dictated by the user. The 320x80 Interface software provides a nice windows-based human interface to control these features.

- When using the **320x80 controller text generator**, the user can **select** between **3 different 30 row fonts, a 15 row font, a 10 row font and a 5x7 character font**. Using the 30 row font, up to 20 characters/line and 2 lines of text can be generated on the display. Using the 15 row font, up to 32 characters/line and 5 text lines can be output on a display. Using the 10 row font, up to 40 characters /line and 8 lines of text can be output on the displays. The 5x7 font can be used to output 53 characters/line and 10 lines of text. A text line within a display can also be altered by using partial screen text images. The user can also use the windows-based text generator within the 320x80 Interface text/graphic editor to create text based graphical images for output on the display panels.
- The 320x80 Interface software also has a **built in scheduler feature**. One time or repetitive events such as displaying unique page(s) of data can be scheduled to occur at a future time with a 1 minute resolution. When a scheduled event time occurs, the 320x80 Interface scheduler software will automatically load the data file, transmit the necessary information to the respective controller module, then command the controller to display the corresponding page(s) of information. The controller can also be commanded to generate automatic cycling of all the page data loaded when the scheduled event occurs.
- The Kent Displays automatic “**Wake/Idle/Sleep mode**” is a standard feature, which **supports extended life battery operation**. If no messages or data is received from the host computer after a pre-determined duration, or no local diagnostic/control activity is sensed by the controller logic, the module will reduce power consumption by activating an “Idle” mode operation automatically. If no further activity is sensed by the 320x80 controller, it will remove the load from the 3-9 volt power source. In “**Sleep mode**”, the display module will contain the image generated, and power consumption will be less than 6 microWatts (power required to maintain the sleep control circuitry, RS-232 & RS-485 controller versions). The module will “wake-up” and resume normal operation after it receives the host wake-up signal.
- Automatic temperature compensation circuitry to **extend the module operating temperature range to -20 and 80 C⁰** (standard module electronics can only be guaranteed from 0 to 70 C⁰)
- Diagnostic switches and an LED indication to support **local operation and control**.

General Specifications – 10120 Controller with 320x80x3.8 Display Modules

Parameter	Value/Description	Units
30 Row Character Pixel Configuration/ Characters per Display/ Lines per Display.	16 pixels wide by 30 pixels high/ 20 Charcters/ 2 Text Lines	--
15 Row Character Pixel Configuration/ Characters per display/ Lines per Display	10 pixel wide by 15 pixels high/ 160 Characters/ 5 Text Lines	--
10 Row Character Pixel Configuration/ Characters per display/ Lines per Display	8 pixel wide by 10 pixels high/ 320 Characters/ 8 Text Lines	--
5x7 Character Pixel Configuration/ Characters per display/ Lines per Display	6 pixel wide by 8 pixels high/ 530 Characters/ 10 Text Lines	--
Text Generator Character Set Capability	30 Row: Modified Letter Gothic Bold 22 point, Modified Tahoma 16 Point, and Modified Times Roman 16 Point. 15 Row: Modified Fixed Distance 11 point. 10 Row: Modified Fixed Distance 9 point (default). 5x7: Typical 5x7 characters.	--
Character Set Controls	<u>Underline.</u>	--
# Display Modules/ Controller	1 (more displays can be “Daisy Chained” from controller header, however additional displays will contain the same image information as display position #1).	--
Message Storage Capability	79 Full Screen Text, 13 Full Screen Graphic, 644 Partial Screen Text (Dyn. Update, Flashing or Normal), 20 Partial Screen Graphic, or 66 Partial Screen Dynamic Update Messages per display.	--
<u>Operating Temperature Range</u> All controller configurations:	*-20 to 80	C ⁰
Storage Temperature Range	-40 to +100 C ⁰ .	C ⁰ .
Possible Controller Address Selections	31 (standard, more are available per request)	
Standard Total Wakeup Duration without communication or local activity	20 (Typical)	Sec.
Standard Active Wakeup Duration Before implementing Idle Mode	10 (Typical)	Sec.

* Indicates display electronics can only be guaranteed between 0 and 70° ambient. Update rates will be slower at lower temperature extremes. Image quality may degrade at operating temperatures above 58 C⁰.

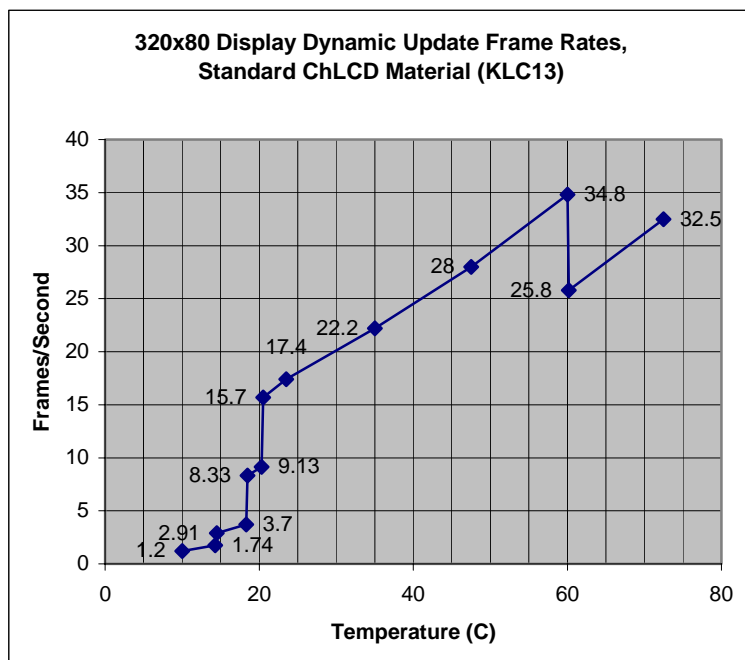
Power Requirements (10120 Controller Module)		
Power Source (V _{DD})	***1.1 – 10 (T = 25 C ⁰)	VDC
**Average "Wake-up" Active Mode Power Consumption (10120-7)	129 (typical, w/ V _{Battery} = 6.0 volts, T = 25 C ⁰), 123 (typical, w/ V _{Battery} = 3.0 volts, T = 25 C ⁰)	mW
**Average "Wake-up" Idle Mode Power Consumption (10120-7)	114 (typical, w/ V _{Battery} = 6.0 volts, T = 25 C ⁰), 105 (typical, w/ V _{Battery} = 3.0 volts, T = 25 C ⁰)	mW
**Average "Sleep Mode" Power Consumption.	Less than 6 microWatts (w/ V _{Battery} = 3.0 - 6.0 volts, T = 25 C ⁰ , RS-232 - RS-485), Less than 72 microWatts (w/ V _{Battery} = 3.0 - 6.0 volts, T = 25 C ⁰ , TTL Port Versions)	uW
Recommended Power Interface (J6)	Standard 2.54 mm pitched via's in PCB.	

** Values indicate average power measurements taken when not generating images (using a DVM). Power values provided in table for display module should be added to "Active Mode" power value above, when considering power values when image generation occurs.

*** Indicates power source must be able to supply sufficient current when battery approaches lower specified voltage limit.

General Specifications – 10120 Controller with 320x80x3.8 Display Modules (Con't)

Dynamic Update Information (Cumulative Drive™), Standard ChLCD Material (KLC13)



Frame rates illustrated reflect measurements taken of the dynamic update of a 10 row (or 20, 30, .. 80 row if "2x-8x" feature implemented) 320x80x3.8-H-YEL display section during the presentation "ON" of a particular image. A slightly faster frame rate will occur when measuring the presentation "OFF" of an image. A slightly slower frame rate can be expected with a Green/Black color combination. As indicated, a typical frames rate of approximately 17 frames/second can be expected at room temperatures (23.5 C⁰).

The chart to the left illustrates the maximum frame rates possible with the 10120 controller a 320x80-display combination. The following additional features are provided and can be programmed for each dynamic update message loaded into the controller RAM:

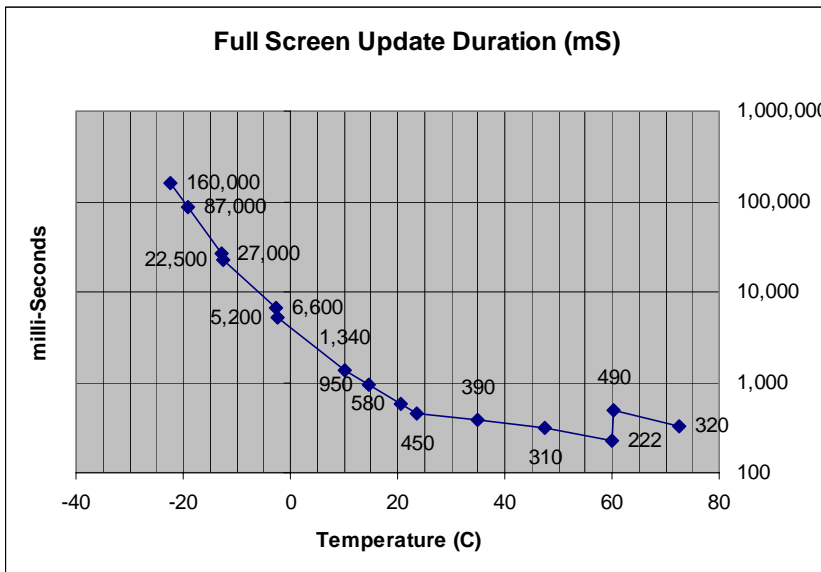
1. **Scroll, Wipe, Open, Close** and **Rotate** presentation methods.
2. Different ON and OFF presentation methods are available for each message (i.e. Rotate ON, Pause, then Scroll OFF).
3. Pause Duration's to allow the requested static frame to remain on the display between ON & OFF presentation methods are programmable from 0.1 to 25.5 seconds, in 0.1-second increments.
4. "2x – 8x" feature – Graphic or text data can be doubled, tripled,... or eight times in size vertically to create a larger image update area.
5. Image invert or non-invert characteristics.

The controller module is also capable of generating **flashing** text messages, allowing the user to dictate the invert pause duration, non-invert duration (each can be set up to 25.5 seconds, in 0.1 second increments), and the number of flashing cycles to implement.

Static frames of data can also be output in a "Swell" and "Fade" modes, which enhance image appearances or aesthetics during the update process.

"Fades" and "Swells" can also be updated in "2x" **horizontal stretch mode**, where the characters are twice as wide as specified previously. Using this feature will limit image distortion when the characters are also stretched vertically using the "2x – 8x" feature described in the bullet above.

Full Screen Update Rate Information, Standard ChLCD Material (KLC13)



The chart to the left illustrates measured full screen (all 80 rows) update durations, with respect to temperature for a 320x80x3.8-H-YEL display and 10120 controller module. Each value indicated on the chart represents the duration required, in milli-seconds to generate a full screen image on all 80 rows of the yellow display module. As indicated on the chart, a typical update duration of 450 mS can be expected at typical room temperatures (23.5 C).

Full screen update durations reflect measurements taken on 320x80x3.8-H-YEL display at the ambient temperatures indicated. A slightly slower update duration can be expected for a Green/Black color combinations. As indicated, a typical update duration of 450 mS can be expected at room temperatures (23.5 C).

10120 Controller Module Communication Interfaces/Information

Serial Communication Format	RS-232 (10120-7 & 10120-9 Modules): Asynchronous, full duplex, 8 bits/byte, 1 Stop, no parity. RS-485 (10120-8 & 10120-10 Modules): half duplex, Everything else same. TTL (10120-12 & 10120-13 Modules): Asynchronous, full duplex, 8 bits/byte, 1 Stop, no parity.
Standard Baud Rate:	19.2k Baud (other rates, such as 38.4k, 9600, 4800, 2400 & 1200 are available per request).
Standard Protocol Format	Standard Kent Displays Character/Graphic Serial Protocol (refer to Kent Displays document 25016 for details).
Recommended Matting Communication Plug	Standard 2mm pitched 3-socketed plug; Hirose P/N DF3-3S-2C w/ DFS-2428SC crimped contacts, or equivalent (RS-232 & RS-485 Configurations) Standard 2mm pitched 4-socketed plug; Hirose P/N DF3-4S-2C w/ DFS-2428SC crimped contacts, or equivalent (TTL Configurations)

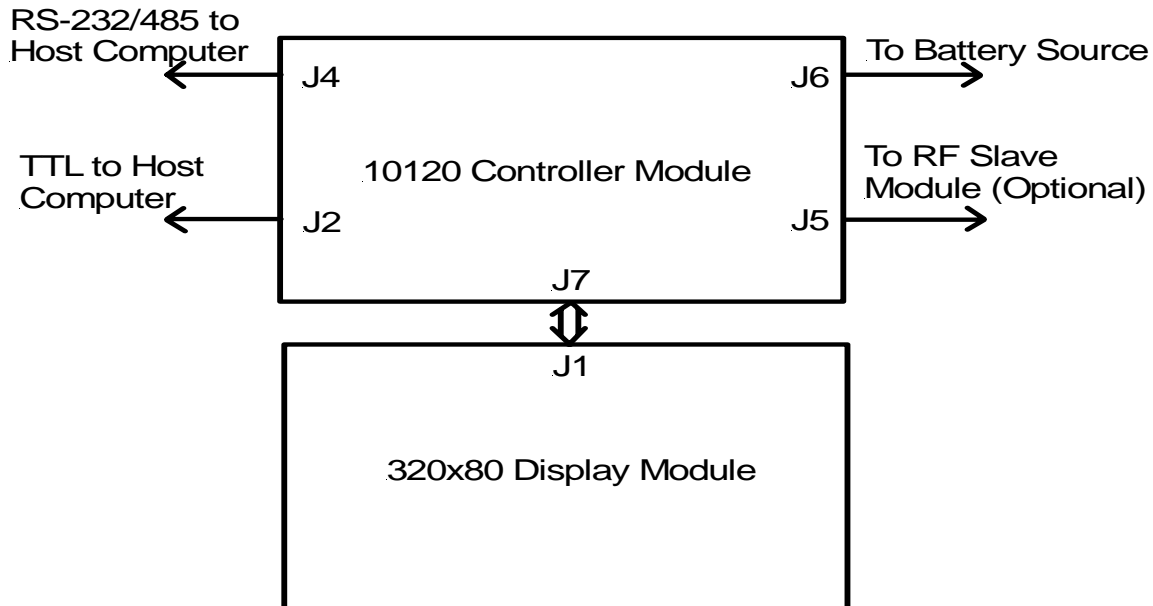
Module Interconnect Descriptions

The following interconnect rules apply when installing only the 320x80x3.8 display module into the finished product:

1. Mount the display module into the finished product using the four mounting holes on the module printed circuit board and bezel frame.
2. In order to preserve the quality and life of the display, the finished product design should incorporate a transparent protective cover to protect the viewing area of the display. Use a material that can block UV light, has anti-glare properties and provides protection from user applied pressure points.
3. Mount the cover as close as possible to the face of the display. Use Acrylite OP-3-P-99, matte finish, with UV blocker, or equivalent material.
4. Connect J1 of the display module to the user's CPU based electronic assembly.

The following additional interconnect rules apply when installing the 320x80 display and 10120 controller module into the finished product, as indicated in following figure:

320x80 Cholesteric Display Modules, with Dynamic Update Capability



Typical Controller to Display Interconnect Diagram

- When installing the controller module into the finished product, align the bottom left-hand mounting hole of the display with the same mounting hole of the controller module. The controller module is designed to be installed directly behind the display module (revision G, or later controller module). When the bottom left-hand mounting holes of the display and controller module are aligned, controller PCB J7 and the display J1 should properly align to enable mechanical and electrical attachment. Use 4-40 stand-offs to secure the controller to the display module. The short component side of the controller module should be facing the backside of the display module.
- Connect the battery or power source terminals of the finished product to J6 of the controller module. Any standard 0.1" type header, connector or open wires can be used as a power interface. Verify the DC power source applied does not exceed 10.0 volts DC.
- Connect to the host computer either using the J4 header location, or to J2 (if a TTL, or 0-5 VDC serial interface is required). Use the plugs and terminations specified in the 10120 general specification table of this document.
- If using the wireless RF communication option, mount the 10158 RF slave module into the finished product in a position to enable the module antenna to be exposed to a maximum of the product exterior. Connect the RF slave module to the J5 header on the controller using the ribbon cable provided with the RF module.
- Place and install the display modules in the finished product accordingly using the 4 mounting holes provided, or using some other equivalent method.

320x80 Controller Power and Communication Interface Details

The following tables outline all the power and communication terminations for the 320x80, 10120 controller module:

Power Interface Connection: J6 – 10120 Controller Modules

Pin #	Symbol	Description
1 (Marked with Pad/via)	+ Power	Positive Power Termination
2 (Marked with O Pad/via)	- Power (Return)	Negative Power Termination.

RS-232/485 Communication Interface: J4 – 10120 Controller Modules

Pin #	Symbol	Description
1	RX_DATA	Module receive data input termination (RS-232). Positive data communication termination point (RS-485). Module "Wake" input (Based on parked low condition).
2	Ground	Ground termination point (RS-232 use only).
3	TX_DATA	Module transmit data output termination (RS-232). Negative data communication termination point (RS-485).

320x80 Cholesteric Display Modules, with Dynamic Update Capability

TTL Communication Interface: J2 – 10120 Controller Modules (Rev. G Controller, or Later only)

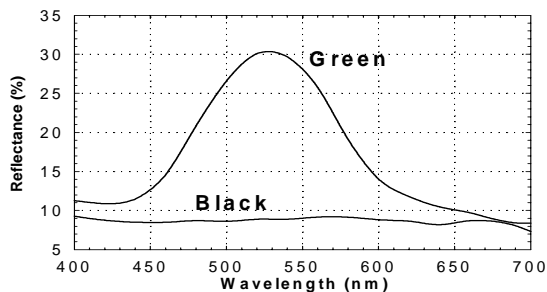
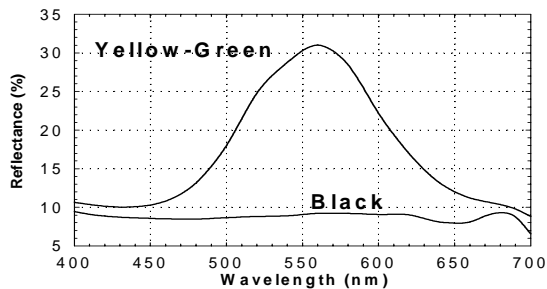
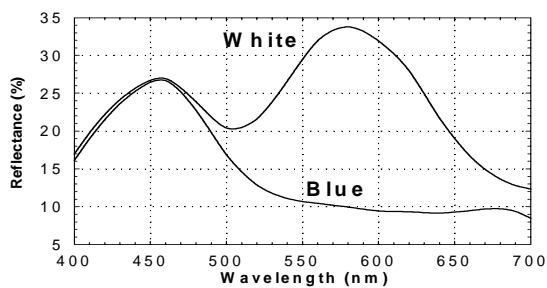
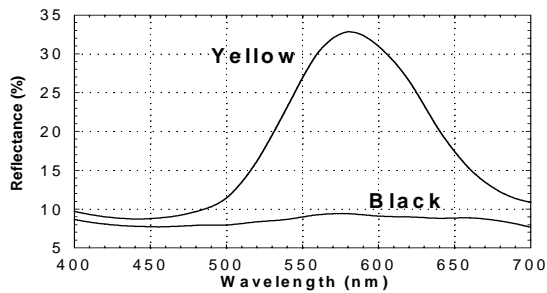
Pin #	Symbol	Description
1	RX_DATA	Module receive data input termination (w/ respect to controller module). Module Wake Input (Based on Parked High condition. Wakes w/ Low input, or when Input is below ~ 0.7 VDC). 0-5 Volt Logic Input.
2	Ground	Ground termination point.
3	TX_DATA	Controller module transmit data output termination. 0-5 Volt Logic Input.
4	+5 VDC	Power Source input to be used for Finished Product Level Shifters circuitry. Source not provided when Controller is in sleep mode.

Local Control/Diagnostic Descriptions – 10120 Modules

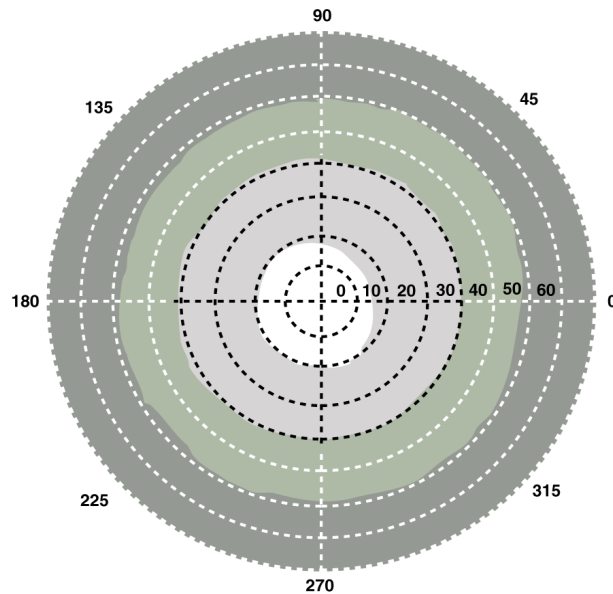
Symbol	Description
"RESET" (SW2)	Controller Reset momentary switch.
"TEST" (SW3)	Controller Diagnostic momentary switch (For local control).
D3	LED Diagnostic Output (For local control feedback).
"WAKE" (SW4)	Module Local "Wakeup" momentary switch.
Address, Bit 1 (R2)	Module Address Bit1 (= 1) Shorting Pads (10120-7,-8,-12), or SW1 Bit1 position (10120-9,-10,-13)
Address, Bit 2 (SW1, pins 2-11)	Module Address Bit2 (= 2) Shorting Pads (10120-7,-8,-12), or SW1 Bit2 position (10120-9,-10,-13)
Address, Bit 3 (SW1, pins 3-10)	Module Address Bit3 (= 4) Shorting Pads (10120-7,-8,-12), or SW1 Bit3 position (10120-9,-10,-13)
Address, Bit 4 (SW1, pins 4-9)	Module Address Bit4 (= 8) Shorting Pads (10120-7,-8,-12), or SW1 Bit4 position (10120-9,-10,-13)
Address, Bit 5 (SW1, pins 5-8)	Module Address Bit5 (= 16) Shorting Pads (10120-7,-8,-12), or SW1 Bit5 position (10120-9,-10,-13)

Note: a 10120-7, 10120-8 and 10120-12 modules are always set as address #1. The address can not be changed without jumper wires.

Optical Characteristics for Typical Standard ChLCD (KLC13), Color Configurations:



The graphs to the left outline the spectral reflectance characteristics for a given display pixel when switched either of the two possible stable states; reflective planar or transparent focal conic. The top line in each chart outlines the reflective characteristics for the planar state. The bottom line outlines the reflective characteristics for the transparent focal conic state. Graphs for the 4 standard color combinations are illustrated.



Contrast Ratio Polar Representation

As illustrated in the polar graph above, all Kent Displays ChLCD products have a 360-degree viewing cone. **Contrast** at near normal viewing angles is as high as 25:1 and reflectivity up to 35% of incident light. Contrast reduces with increased viewing angle, but is still excellent at 11:1 when viewed at the edge of the display. Since no polarizers are used, display contrast reduces uniformly in all directions when the viewing angle is increased.

The above reflectance curves reflect measurements taken from a single pixel. Actual reflectance will depend on display resolution, aperture ratio and other factors.

Typical ChLCD Spectral Reflectance Characteristics

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