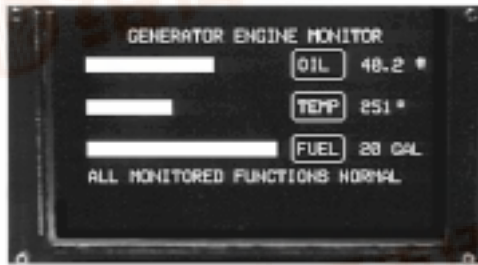# Plasma Panel Display Modules
192 by 88 Graphics Display
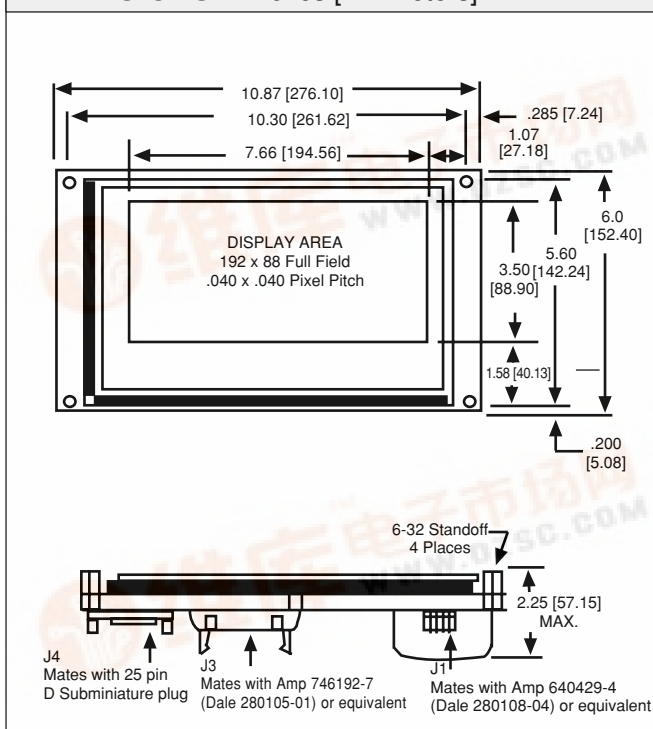## with Drive Electronics and Controller

The APD-192G088 is a full field dot matrix display with 192 columns and 88 rows. It includes drive electronics and a microprocessor based controller. The controller maintains all the refresh memory, character generation and control logic with parallel or serial interface and a DC to DC converter to generate the necessary panel voltage. A touch panel version is also available (APD-192G088-5).

FEATURES
- 192 x 88 full field dot matrix
- Parallel and serial interfaces
- All functions software accessible
- Character and bit plot graphics
- Wide viewing angle
- High brightness
- Software dimming
- Low input voltage
- Compact size

ENVIRONMENTAL SPECIFICATIONS
Operating Temperature: 0°C to + 55°C.
Storage Temperature: - 55°C to + 85°C.
Relative Humidity: 10 - 90% R.H. non-condensing.
Mechanical Shock: 50G 1/2 sine wave, 11 msec duration, 5 shocks in each of 6 directions.
Vibration: 0.018" [0.457] displacement amplitude from 10 to 50 Hz, 2G acceleration from 50 to 2000 Hz logarithmic sweep rate, along each side of the 3 major axes.

OPTICAL SPECIFICATIONS
Viewing Area: 7.66" [194.56] x 3.50" [88.90].
Pixel Size: 0.020" [0.508].
Pixel Pitch: 0.040" [1.02].
Luminance: 80 foot lamberts.
Color: Neon orange.
Viewing Angle: 150° cone.

STANDARD ELECTRICAL SPECIFICATIONS

	MIN.	TYP.	MAX.	UNITS
Logic Supply Voltage	+ 4.75	+ 5.0	+ 5.25	V
Logic Supply Currrent	—	700.0	—	mA
Panel Supply Voltage	+ 11.4	+ 12.0	+ 12.6	V
Panel Supply Current *	—	1.0	2.2	A
Logic One Voltage	2.0	—	—	V
Logic Zero Voltage	—	—	0.8	V
Logic Zero Input Current	—	—	- 0.4	mA

*This is the input to a DC/DC converter.
There may be peak in-rush currents higher than shown.

GENERAL DESCRIPTION
The APD-192G088 consists of a DC plasma graphics display panel, drive circuitry and controller.
The controller maintains all the refresh memory, character generation and control logic to enable the module to serve as a direct readout device for communications terminals, computer readouts, micro-processor instruments, or any other system requiring a self-contained readout. It is programmable to operate in a parallel or serial mode.
The parallel interface is a basic 8 bit parallel interface with hand-shaking and some dedicated control lines. The serial interface is RS-232C compatible with 8 selectable baud rates (from 150 - 19,200).
Single byte and two byte commands allow simplified code generation, yet accomplish complex display tasking such as scrolling or inserting lines and characters. The character generator is a 4K x 8 bit EPROM with 256 characters consisting of 128 ASCII characters (including control codes) and 128 block graphics characters. The character set can be factory or user modified.
Two means of using graphics are supported - character graphics, in which the user sends the proper ASCII code to select the desired graphics character, or the bit plot mode. The character graphics mode allows easy mixing of text and graphics images and the bit plot mode (using set and reset commands) allows any graphic pattern to be drawn a bit at a time.
A DC/DC converter generates the required display voltages from + 12 VDC and all input lines are LSTTL compatible with 4.7 kilohm pull-up resistors to Vcc.

DIMENSIONS in inches [millimeters]

INTERFACING

PARALLEL INTERFACE

The parallel interface offers two forms of hand-shaking called Ready and Data Taken. Each 8 bit word appearing on the data bus is latched with the falling edge of the Data Strobe pulse.

This same negative transition notifies the on-board processor that data has been entered. The Ready signal then goes low and the Data Taken signal goes low momentarily. The Ready signal remains low until the command is completed or the data has been entered. The Data Taken pulse is normally 800 nanoseconds long and indicates when the on-board processor has read the input latch. Data may be entered into the input latch after the rising edge of Data Taken.

SERIAL RS-232C INTERFACE

(See J4 pin descriptions.) The controller is considered to be a DTE type device and will operate with a host that is either a DTE or DCE type device. The serial input and output lines meet RS-232C specifications. Serial data is entered asynchronously with selectable baud rates. The byte format is 1 start bit, 8 data bits and 1 stop bit.

ABRIDGED FUNCTION SUMMARY

CONTROL CODES	HEX	ASCII
Cursor Home	0E	CNTRL N
Carriage Return	0D	CNTRL M
Cursor Down (Line Feed)	0A	CNTRL J
Cursor Up	0B	CNTRL K
Cursor Right	09	CNTRL I
Cursor Left	08	CNTRL H
Alter Cursor Character Position	11	CNTRL Q
Cursor Character Address (0-1F)	##	
Alter Cursor Row Position	13	CNTRL S
Cursor Row Address (0-A)	##	
Cursor On	12	CNTRL R
Cursor Off	14	CNTRL T
Clear Screen	0C	CNTRL L
Character Insert	0F	CNTRL O
Character Delete	10	CNTRL P
Line Insert	16	CNTRL V
Line Delete	17	CNTRL W
ESCAPE CONTROL CODES		
Erase to End of Line	1B,0D	ESC CNTRL M
Erase to End of Screen	1B,18	ESC CNTRL X
Erase Line	1B,13	ESC CNTRL S
Erase Line and Carriage Return	1B,25	ESC SHIFT %
Alter Brightness	1B,0C	ESC CNTRL L
0 = Brightest	##	
7 = Dimmest		
Scroll	1B,1A	ESC CNTRL Z
*End Scroll	1B,20	ESC SPACE
Blank Display (on/off alternately)	1B,11	ESC CNTRL Q
Enter Bit Plot Mode	1B,16	ESC CNTRL V
*Exit Bit Plot Mode	1B,17	ESC CNTRL W
Reset Controller (to initial state)	1B,19	ESC CNTRL Y

* Indicates power up condition.

PIN DESCRIPTION

CONNECTOR	PIN	SIGNAL	DESCRIPTION
J1	1	+ 12 VDC	Panel supply voltage.
	2	+ 5 VDC	Logic supply voltage.
	3	GND	Ground.
	4	NC	No Connection.
J3	1,2,4,5, 7,6,3,9	DB7-DB0	Data bus lines used transfer data and commands to display.
	13	READY	Used to monitor the display's activity. A logic 0 indicates that the display is busy and cannot respond to new data.
	15	DATA STROBE	Used to notify the display that valid data is present on the data bus. The data byte is loaded with the falling edge of DATA STROBE.
	17	DATA TAKEN	This output goes to logic 0 for approximately 800 nsec when the display has accepted the input data byte after DATA STROBE goes low. New data may be presented coincident with the leading edge of this signal.
	22	SYSTEM SELECT	Used as a unique unit select input. A logic 0 on this line disables the DATA STROBE input.
	10	CURSOR DISABLE	A logic 1 will disable the visual cursor. (This can also be accomplished with a data bus command.)
	16	INITIALIZE	Serves as a display reset. A logic 0 will initialize the controller to its power up state.
	12	RESERVED	This pin is to be left unconnected.
	25,26	+ 5 VDC	Logic supply voltage.
	19,20	GND	Ground.
J4	3	RECEIVE DATA	The display receives data on this pin. (The signal originates at the DCE device transmit pin 2.)
	2	TRANSMIT DATA	The display transmits received data on this pin. (The signal originates at the DCE device receive pin 3.)
	4	READY TO SEND	This pin will be low when the display is busy and cannot accept new data. (This pin is connected to pin 5 of the DCE device.)
	7	GND	Signal ground (required).

(Pins 6, 8, and 20 of J4 are connected together internally.)

NOTE: Unidentified pins are not connected.

WARNING: Wrong connections or reversing J3 may cause permanent damage to the display and host interface.

ORDERING INFORMATION

DESCRIPTION	PART NUMBER
Display, Drive Electronics, Controller Board (Includes DC/DC converter)	APD-192G088
Parallel Data Connector Kit	280105-01
Power Connector Kit	280108-04
Non-Glare Filter (amber circular polarized) - other filters available - contact factory	280109-06

Disclaimer

All product specifications and data are subject to change without notice.

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