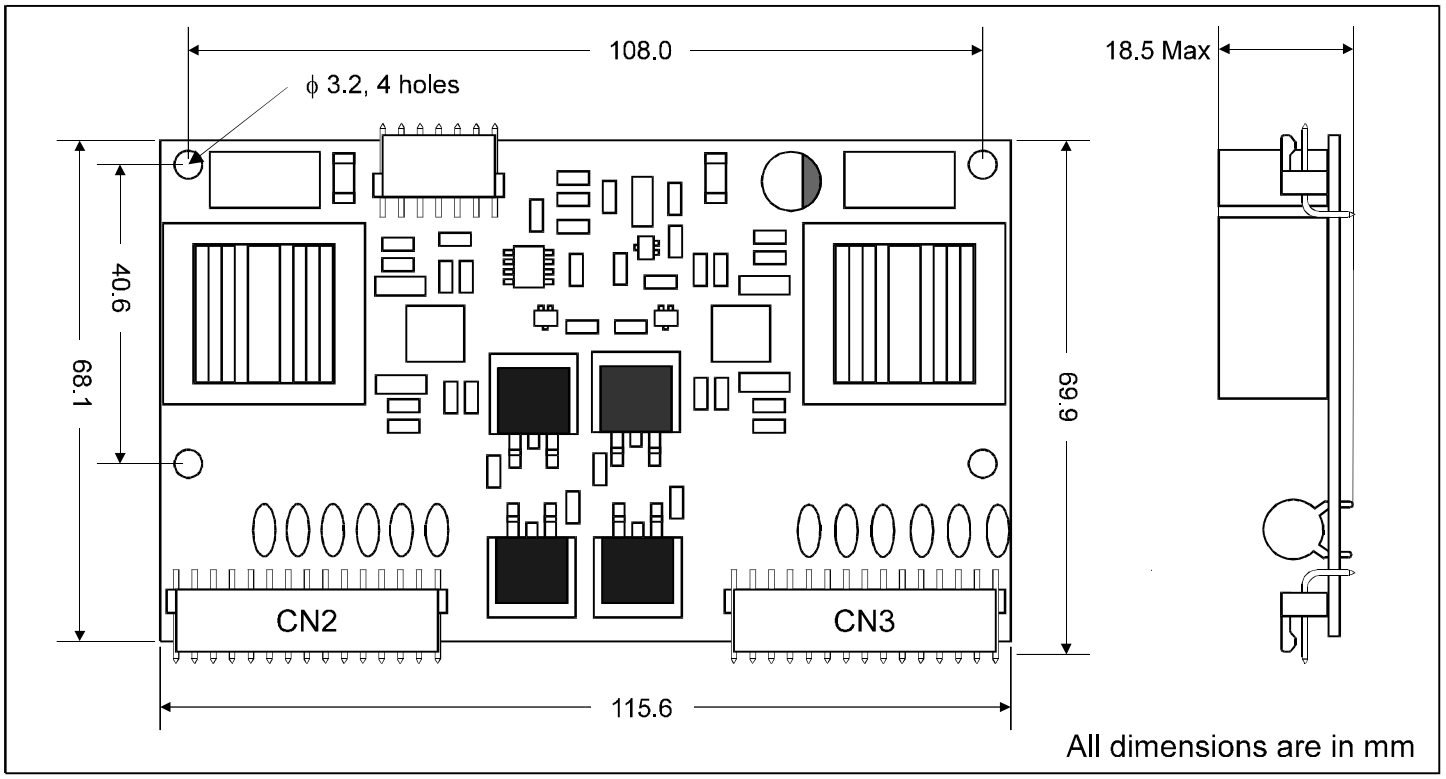
Landmark Technology

CCFL Inverter BI320A for Landmark LCD Backlights & Modules



Introduction

BI320A is a CCFL inverter which operates the VHB backlights in Landmark 17" sunlight readable LCD modules. The inverter has an on-board pulse width modulation (PWM) dimming circuit to provide an extremely wide luminance adjustment range. Over the entire dimming range, there is no noticible lamp flickering and the uniformity of the backlight is well maintained. When using the BI320A with Landmark sunlight readable LCD modules, it is not necessary to synchronize the PWM circuit to the vertical sync signal of the LCD.

The BI320A inverter operates at a 12V DC input and can drive up to 12 CCFLs for a maximum lamp power of 42 Watts. In addition, the inverter has a regulated +5V output which serves as a voltage source for the dimming control circuit.

Absolute Maximum Rating

Parameters	Min.	Max.	Units
Inverter Input Voltage (Vin)	11.0	13.0	Vdc
Operating Temperature Range	0	50	^{o}C
Storage Temperature Range	-20	80	^{o}C

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www.landmarktek.com Rev. 08/2006

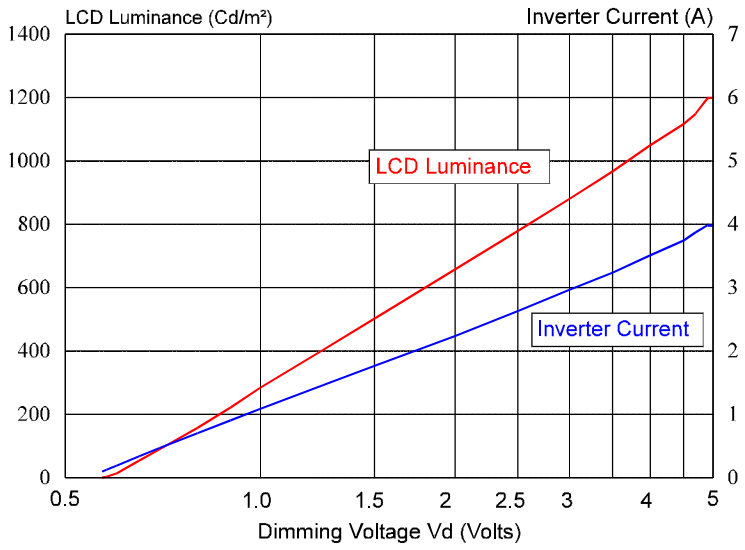
Electrical Characteristics

Parameters	Min.	Typ.	Max.	Units	Conditions
Input Voltage (Vin)	11.5	12	12.5	Vdc	
Input Current (I) with LM177-170EG01		4.0		Adc	Vin = 12V, Vd = 5V
Lamp Starting Voltage (Vst)		1,700		Vrms	Vin = 12V
Frequency (f)	40	42	44	KHz	
ON/OFF Control - OFF		0	0.2	Vdc	
- ON	4.8	5		V dc	
Dimming Voltage (Vd)					
Duty Cycle 100%		4.9	5	Vdc	Max. brightness
Duty Cycle 0%	0.54	0.56	0.58	Vdc	Zero brightness
+5V Output (+5VOUT)	4.85	5	5.25	Vdc	11.5 < Vin < 12.5V
+5V Output Source Current			5	mA	

Typical Electro-optical Performances

With the Landmark 17" LCD module LM177-170EG01, the LCD screen luminance (brightness) versus the dimming voltage setting is shown in the following figure. As the brightness decreases, the inverter input current and the power reduces accordingly.

Typical Dimming Characteristics
LM177-170EG01 LCD Module with BI320A Inverter



Connector Pin Assignments

Pin #	Function
Input Connector CN1 (Molex 22-05-3071)	
1	+5 V Output
2, 3	+12 V Input
4	Dimming Control
5, 6	Ground
7	On/Off Control
Mating Housing - Molex 22-01-3077	
Output Connector CN2, CN3 (Moles 22-0503151)	
1, 3, 5, 7, 9, 11	Lamp Connections
2, 4, 6, 8, 10, 12	No Connections
15	Lamp Commons
Mating Housing - Molex 22-01-3157	

Dimming Control

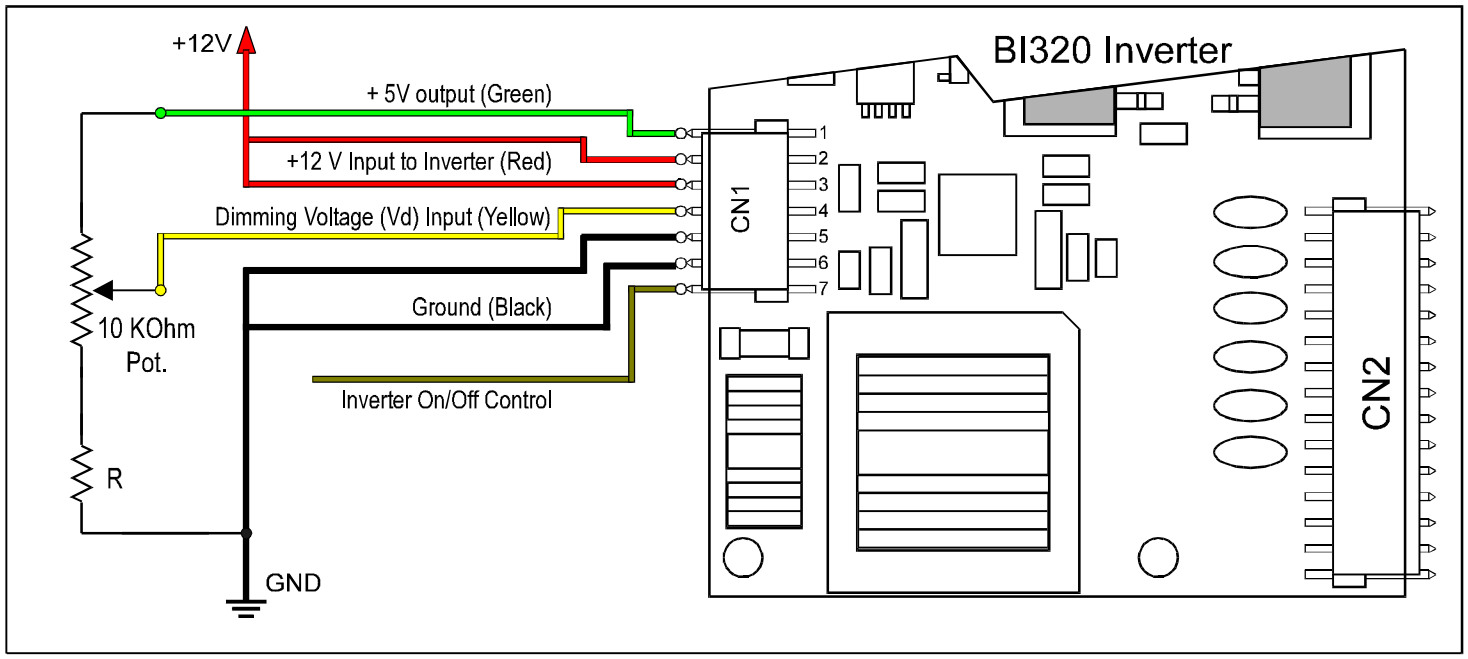
The BI320A accepts a 0 - 5V analog voltage for dimming control. Typical dimming characteristics with Landmark sunlight readable LCD modules are shown in the figures on page 2.

The BI320A inverter has a pulse width modulation (PWM) dimming circuit for LCD screen luminance (brightness) adjustment. In general, inverters with PWM dimming have a very wide brightness adjustment range. With a good power supply, the BI320A inverter can achieve a maximum dimming ratio of about 200:1. Hence, the LCD screen brightness can be adjusted from 100% to 0.5%. For a detailed discussion on the PWM dimming, please refer to TechNote TK0300 at the FAQ section of the Landmark website.

When the dimming voltage Vd equals 5V, the LCD screen brightness is at 100%. Reducing the Vd value decreases the screen brightness until at Vd = 0.56V, the screen brightness reaches 0% (or 0 Nits). In order to fully utilize the available dimming range, Vd should be biased to about 0.56V and then ramped up to 5V

The dimming voltage Vd can be generated simply by using a potentiometer as shown in the following figure. In this circuit, a series resistor is used to bias the minimum Vd value at about 0.56V. The value of this resistor depends on the dimming range needed. For example, if R is set at 1.5 KOhm, the minimum Vd value is 0.65V, which allows a 50:1 brightness control range (from 100% to 2%) over the full potentiometer adjustment. The luminance control range can be increased by lowering the resistance of this series resistor slightly. For example, with a 1.4 KOhm resistor, the range of luminance adjustment increases to 100:1. However, further reducing the R value may turn the backlight off when the potentiometer is at its lowest setting.

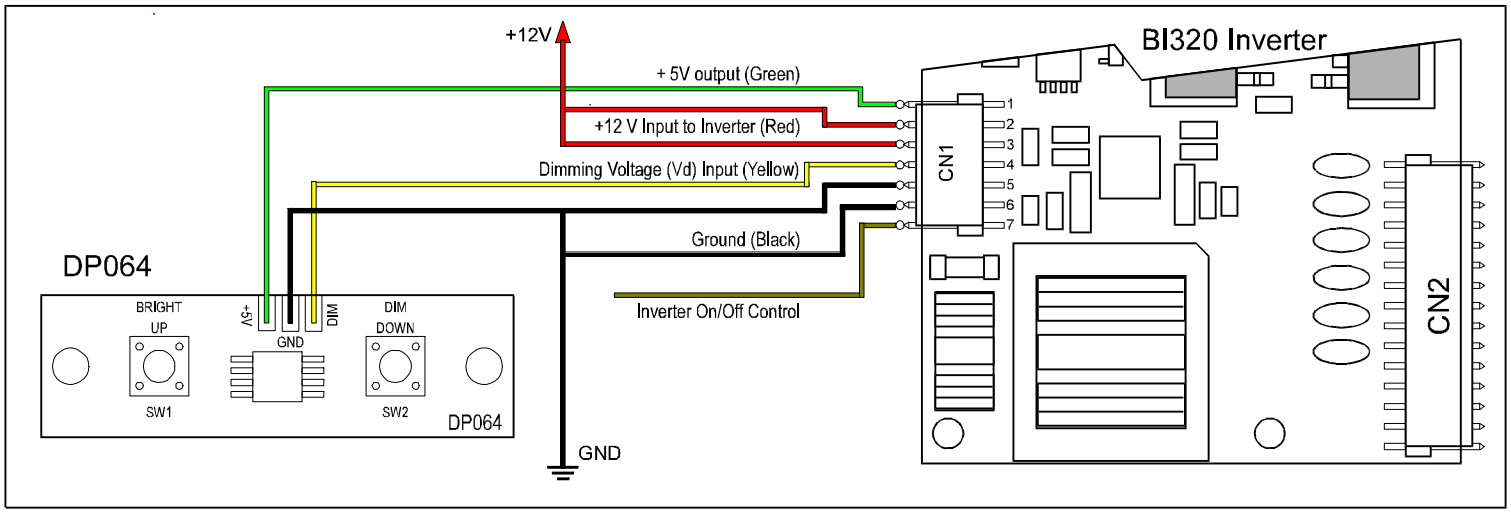
The on-board regulated +5V supply (Pin #1 of the input connector CN1) can power this dimming circuit. The current drain on this supply is only 0.45 mA, well within its 5 mA capacity. Also, use a logarithmic potentiometer in order to achieve a nearly linear luminance adjustment.



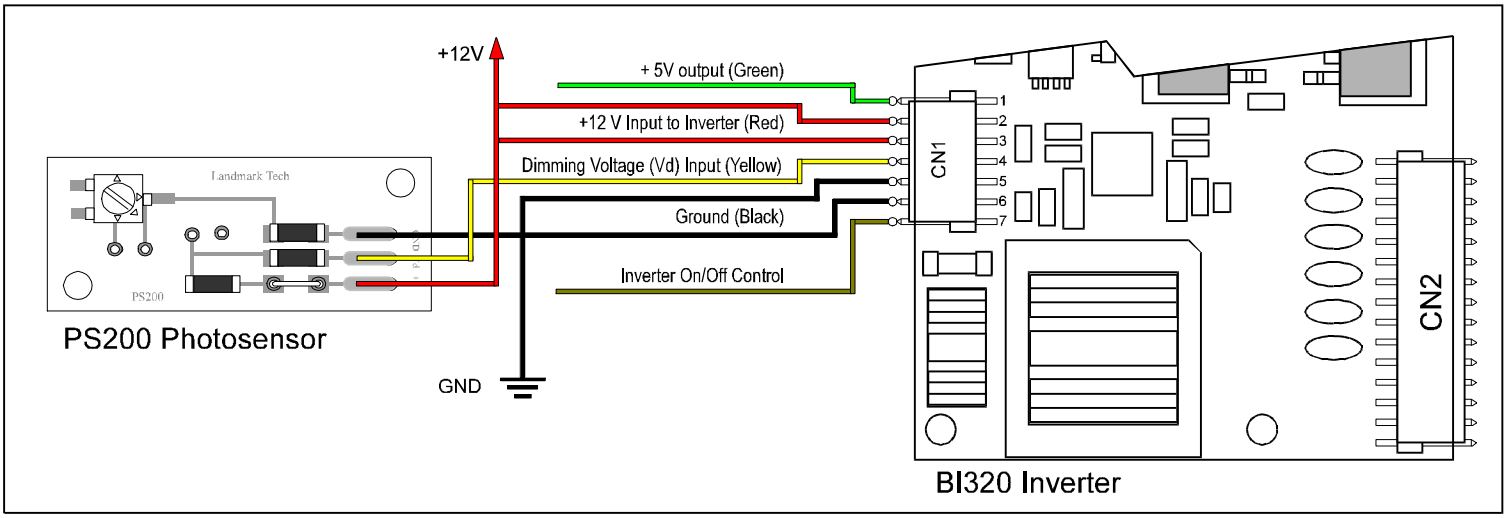
Alternatively, there are two inverter accessories that can be used with our BI320A to control the LCD brightness

1. The DP064 - a 64-step digital potentiometer.
2. The PS200 - a photosensor that generates the dimming voltage Vd based on the ambient light level.

The DP064 steps through 64 levels of Vd values with a pair of push button switches. Pushing the Bright (or Up) switch increases the Vd value and the LCD brightness. Pushing the Dim (or Down) switch reduces the Vd value and the LCD brightness. The figure below shows the connections between the DP064 and the BI320A inverter. The +5V supply on the BI320A is used to power the DP064 digital potentiometer.



The PS200 senses the ambient light level and outputs a Vd value accordingly. During the daytime when the ambient light level is high, it generates a Vd at 5 V to operate the LCD at its maximum screen brightness. As the ambient light level reduces, the Vd output goes down to reduce the LCD brightness automatically. The following figure shows the connections between the PS200 and the BI320A inverter. The PS200 requires +12V to operate. So, it is connected to the +12V supply of the inverter (pin #2 & 3).



For further details on the DP-064 digital potentiometer and the PS200 photosensor, please refer to their data sheets on Landmark's website.

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