

Introduction

BI520A and BI522A are CCFL inverters used to drive the VHB backlights in Landmark 32" and 37" very high brightness LCD modules for digital signage applications. The BI520A is the master inverter that has an on-board pulse width modulation (PWM) circuit to provide a wide LCD brightness adjustment range. The BI522A is a slave unit which accepts a control signal from the BI520A to adjust backlight brightness and On/Off control. Over the entire dimming range, there is no noticeable lamp flickering and the uniformity of the LCD brightness is well maintained.

The BI520A & BI522A inverters operate on a 24V DC input. Each inverter can deliver a maximum lamp power of about 100 Watts. In addition, the BI520A inverter has a regulated +12V output which can power some Landmark dimming control circuits such as the Digipot DP064-DS and the photosensor PS200-DS.

Absolute Maximum Rating

Parameters	Min.	Max.	Units
Inverter Input Voltage (Vin)	22.0	26.0	Vdc
Operating Temperature Range	0	50	°C
Storage Temperature Range	-20	80	°C

Electrical Characteristics

Parameters	Min.	Typ.	Max.	Units	Conditions
Input Voltage (Vin)	23	24	25	Vdc	
Input Current (I) BI520A, BI522A for 32" LM178-320W01 for 37" LM182-370WX1		7.0 9.1		Adc	Vin = 24V at max. LCD screen luminance
Lamp Starting Voltage (Vst)		2,200		Vrms	Vin = 24V, Vd = 5V
Frequency (f)	49	52	55	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. backlight brightness
Duty Cycle 0%	???	0.56	0.58	Vdc	Zero backlight brightness
+12V Output (+12 OUT)	11	12	13	Vdc	23 < Vin < 25V
+12V Output Source Current		10		mA	

Connector Pin Assignments

BI520A Input Connector CN1 (Molex 22-05-3091)		BI522A Input Connector CN1 (Molex 22-05-3071)	
Pin #	Function	Pin #	Function
1	+12 V Output	1, 2	+24V Input
2, 3	+24 V Input	3, 4	Ground
4	Dimming Control, Vd Input	5	Control Signal Input (from BI520A)
5, 6	Ground	6	Ground
7	On/Off Control Input	7	No Connection
8	Ground	Mating Housing BI520A - Molex 22-01-3097	
9	Control Signal Output to BI522A	BI522A - Molex 22-01-3077	

Output Connectors - BI520A & BI522A

CN3, CN4, CN6, CN7 - JST SM04(4.0)B-BHS-1-TB	Pins 1, 2, 3, 4	Lamp Connections
CN1, CN2 - JST SM02B-BHS-1-TB	Pins 1, 2	Lamp Common

Lamp Connections

The CCFLs in the 32" and 37" LCD modules are arranged in groups. Each group has two JST 4-pin connectors for the lamps and one JST 2-pin connector for the lamp common. The master inverter BI520A drives two groups of lamps. However, the slave inverter BI522A has two different models. For the 32" LCD module, there are a total of 3 groups of lamps. Therefore, the slave inverter BI522A-1, which drives 1 group of lamps, is used. For the 37" LCD module with 4 groups of lamps, the slave inverter BI522A-2, which drives 2 groups of lamps, should be used.

Each group of connectors must be plugged into the mating connectors in a group on the inverters. That is, you cannot plug the lamp connectors in one group and the common connector into a different group. There are labels identifying the groups on the inverters and on the LCD modules. Please be sure to plug the 3 connectors of a group into the 3 mating connectors of a group. Failure to do so may cause damage to the inverters or the LCD modules.

Connections to BI520A and BI522A

Both the BI520A and BI522A require 24V power inputs to run. In addition, the slave inverter BI522A requires a control signal from the master inverter BI520A. Besides the power and ground, the master inverter BI520A also has the dimming voltage (Vd) input, the On/Off control input, the +12V output to power some dimming circuits, and of course, the control signal output to drive the slave unit BI522A. Fig. 2 below illustrates the connections and the interconnections of the two inverters. Please refer to page 2 for the Pin Assignments of the two CN1 connectors.

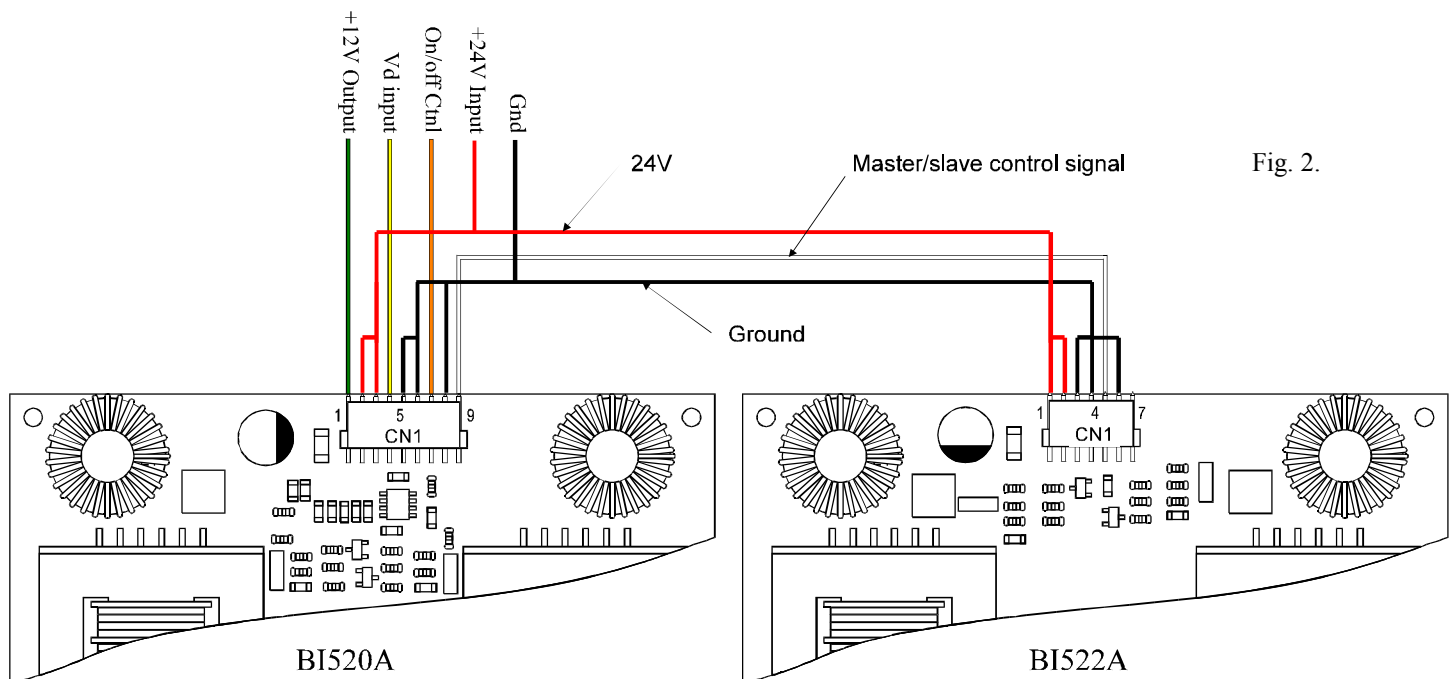


Fig. 2.

It is possible to use two separate 24V power supplies to power the BI520A and BI522A inverters. However, there should be a ground connection between the two inverters to ensure that the control signal from the master inverter BI520A works to drive the slave unit BI522A. Both inverters carry heavy current. So, please use heavy gauge wires and make sure that each input connector has two pins for 24V and 2 pins for the Gnd to carry the heavy current.

LCD Screen Brightness Adjustment

The BI520A inverter accepts a 0 - 5V analog voltage for LCD brightness (dimming) control. This dimming voltage V_d is fed into the master inverter BI520A at pin #4 of connector CN1. Typical dimming characteristics with Landmark 32" LM178-320W01 VHB LCD module is shown in Fig. 3.

From the curve, the LCD reaches its full brightness at about 1,150 nits when V_d equals 5V. As the V_d value decreases, the screen brightness is dimmed down, and at $V_d = 1V$, the LCD brightness reduces to about 180 nits. For digital signage applications, this brightness is perhaps already too low even at night. However, the BI520A & BI522A inverters can adjust the screen brightness further down as shown in Fig. 2, and when $V_d = 0.56V$, the screen brightness reaches 0.

The dimming voltage for LCD brightness control can be generated by using a potentiometer and the +12V source from the BI520A inverter (Fig. 3). In this circuit, a 12 KOhm resistor is used to set the maximum V_d value at 5V, and a 2 KOhm resistor is used to limit the minimum V_d value to 1V. This provides an adjustment of the LCD brightness from 100% to about 16%. (1,150 nits to about 180 nits for LM178-320W01).

Alternatively, there are two inverter accessories that can be used to control the LCD brightness of large size LCDs for Digital Signage applications.

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

The DP064-DS steps through 64 levels of V_d value with a pair of push button switches. Pushing the Bright (or Up) switch increases the V_d value and the LCD brightness. Reversely, pushing the Dim (or Down) switch reduces the V_d value and the LCD brightness.

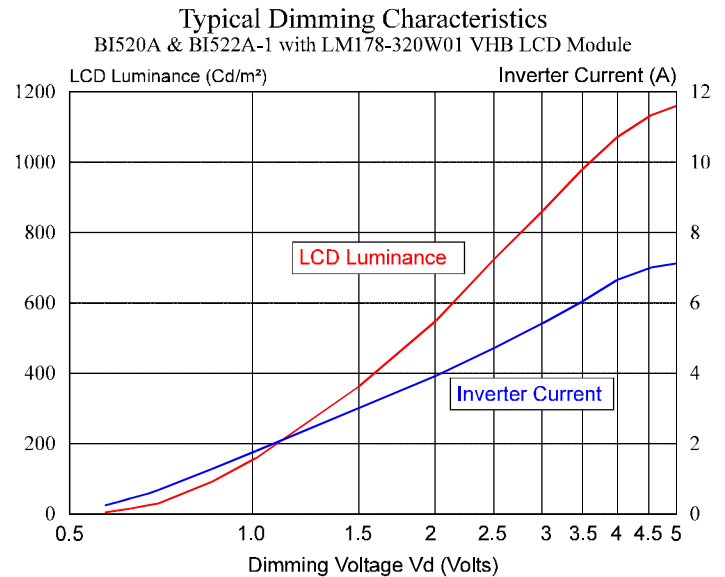


Fig. 3. Typical LCD Screen Luminance & Inverter Current vs. Dimming Voltage (V_d) - LM178-320W01, 32" very high brightness LCD module

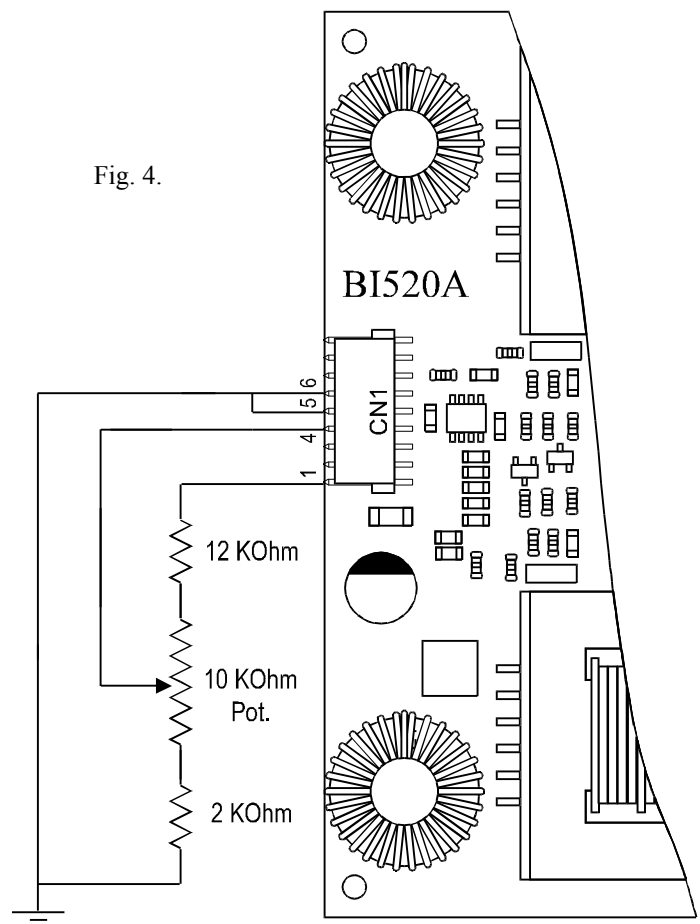


Fig. 4.

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

Both the DP064-DS and the PS200-DS can be operated with the +12V source from the BI520A inverter. For details, please refer to DP064-DS and PS200-DS data sheets.

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