

TTL Compatible On/Off Control for BI200A and BI220A Inverters

The ON/OFF Control Signal

All Landmark inverters have an On/Off control pin on the input connector CN1 for backlight on/off control. To turn off the backlight, the On/Off control pin is connected to ground voltage (0V).

For BI200A and BI220A inverters, the On/Off control pin should be left floating (not set to +5V) in order to turn on the backlight and use the dimming control. This is due to the fact that the dimming pin and the On/Off control pin are tied together internally through a 100 KΩ resistor. If the On/Off pin is connected to +5V, the internal voltage that controls the dimming circuit is set at +5V regardless of what the dimming voltage (Vd) input is. As a result, the backlight is turned on at the maximum brightness with no dimming. In this sense, the On/Off control signal for BI200A and BI220A inverters is not TTL compatible.

On the other hand, the On/Off control signal for BI224A, BI320A, and BI330A inverters is TTL compatible. To turn off the inverter, the On/Off pin is connected to 0V, and to turn on the inverter, the pin is connected to +5V. The dimming control functions normally with the On/Off pin connected to +5V.

For certain applications with BI200A and BI220A inverters, it is desirable to have the On/Off control set

to +5V to turn on the backlight and maintain the dimming capability. The following are the instructions to modify the BI200A and BI220A inverters for this purpose.

For BI200A Inverter

Fig 1 below depicts what need be done to modify the BI200A inverter. Basically, there are two steps:

1. Add an external diode in series with the On/Off control pin. In Fig. 1, we recommend the 1N4148 diode since it is being used elsewhere on the BI200A inverter. Alternatively, any diode with a forward voltage drop of less than 0.5V and reverse resistance greater than 1 MΩ can be used.
2. Change the value of R6 from 34KΩ to 18KΩ. Use a resistor with 1% tolerance in 1206 surface mount package. R6 is located next to the aluminum can capacitor as shown in Fig. 1. Remove the original R6 resistor which has its resistance marked in white characters as 3402 (resistance = 340 plus two zeros = 34000 Ω). Then solder the new resistor (marked 1802) to the pads.

A diode exhibits a very high resistance (usually in many MΩs) when it is reverse biased. When it is forward

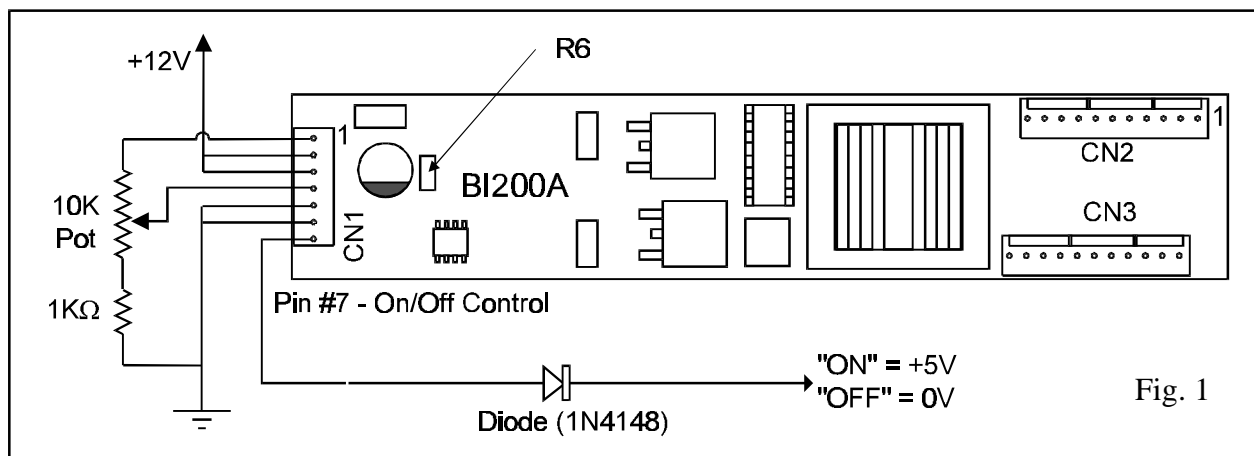


Fig. 1

biased, its resistance becomes very low. In the meantime, there is a forward voltage drop across the diode (V_f). For low cost small signal diodes, V_f is usually about 0.5V or less.

When the On/Off control signal is set to +5V, the diode is in reverse bias and exhibits a very high resistance. This prevents the +5V On/Off control voltage being applied to the dimming circuit. Consequently, the dimming circuit is controlled by the voltage applied to the dimming pin (V_d). The backlight now is turned on and the dimming control is also functioning.

When the On/Off control signal is set to 0V, the diode is in forward bias. If the diode forward voltage drop V_f is about 0.5V, then we will have a problem to turn the backlight completely off if the dimming voltage V_d is set at any value greater than V_f .

In order to turn off the backlight completely, the voltage applied to the dimming circuit of the BI200A inverter must be less than 0.32V. At this voltage level, the pulse width modulated (PWM) lamp current wave form reaches 0% duty cycle (i.e., average lamp current = 0, and the backlight is completely turned off). However, if V_d is greater than V_f and also if $V_f > 0.32V$, then the voltage applied to the dimming circuit is greater than 0.32V. As a result, the backlight is operated at a low brightness level but is not completely turned off. So, the "Off" control fails.

Changing the value of R6 from 34K Ω to 18K Ω raises the voltage required to achieve 0% PWM duty cycle to

about 0.56V. Since this value is higher than the V_f value of the diode, the backlight will be turned off completely when the On/Off control pin is set to 0V.

The change of R6 value from 34K Ω to 18K Ω will not effect the dimming voltage required to reach 100% PWM duty cycle for maximum backlight brightness.

For BI220A Inverter

The dimming and the On/Off control circuitry for the BI220A inverter is identical to those of the BI200A. Please follow the same modification steps described above to implement a TTL compatible On/Off control for the BI220A inverter.

The location of the resistor R6 on BI220A inverter is shown in Fig. 2 below.

After the modification, the dimming characteristics or curves (i.e. luminance and inverter current versus dimming voltage) of the inverter change slightly in the low backlight brightness (or high dimming ratio) region. For a typical characteristics, please refer to the data sheet of Landmark Technology inverters BI224A, BI320A, or BI330A. These inverters have the diode added to the On/Off control circuit and the value of R6 is changed to 18K Ω .

For further description on Landmark Technology inverters, and the details of PWM dimming with lamp current wave form etc., please refer to Landmark Tech note TK0300.

