

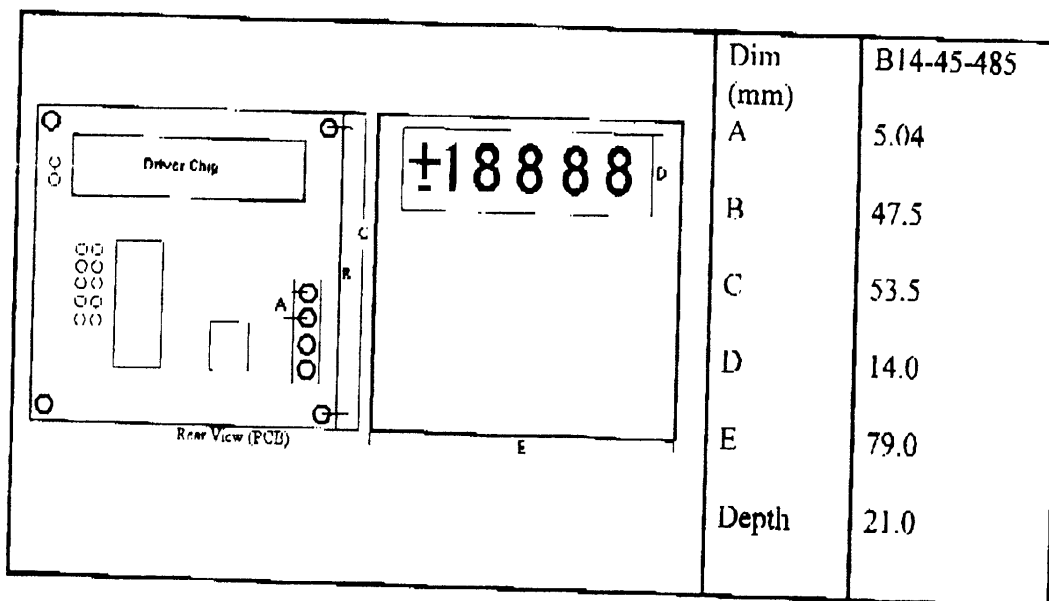
NEXUS 4 1/2 digit LED Display with driver and RS485 serial bus. **MACHINES** User Manual Ver 1.0

B14-45-485

System Description

General

The B14-45-485 display is a 4 1/2 digit 14mm LED display with an on board driver and RS485 (differential bus) communications. The display can be daisy chained in a multidrop manner with up to 31 units on the same bus. Each unit has a 5 bit header for address selection. The host software sends 5 bytes of information using a 2400 baud N,8,2 protocol which consist of the unit address and the LED segment data. An address of 1Fh causes the LED display to update thus allowing multi drop units to all change data at once independent of the update rate of the host. Communications is via a 2 wire differential RS485 bus allowing use of the display remote from the host controller. A single +5 volt supply is required. The LED display is a high brightness 14mm character height, the driver facilitates dimming with an external potentiometer.



Pinout

1	2	3	4
0 Volt	+5 Volt power	A (RS485 bus)	B (RS485 bus)

Features

- Serial interface with RS485 differential bus
- Single +5 volt supply
- Daisy chain up to 31 units on a single bus
- Address selection header
- Brightness programmable via external potentiometer
- Update all command
- 2400,N,8,2 signalling protocol
- Integral LED driver
- Excellent optical matching

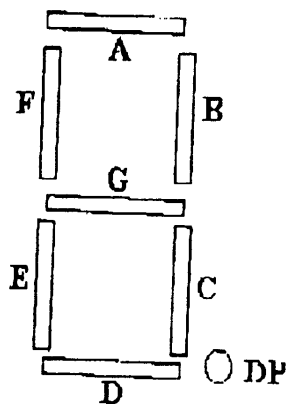
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Electrical Characteristics

Parameter	Min	Typ	Max	Units	Conditions
Supply voltage	4.5	5.0	5.5	V	
Power supply current			700	mA	All segs on
Baud rate		2400			baud
Data bits		8			bits
Stop bits		2			bit
Parity		none			
RS485 Common mode input			3	V	V _{cc} =5.0 volts
RS485 Differential sensitivity	300			mV	V _{cc} =5.0 volts
Luminous Intensity					
B14-45-485 IIE red		2.8			mCd
B14-45-485 Green		1.8			mCd
Brightness setting resistor		6.8		k ohms	V _{dd} =5V +/- 10%
Operating temperature	0		70	deg C	V _{dd} =5V 4 LED's on

Segment versus Databit mapping

D7	D6	D5	D4	D3	D2	D1	D0
dp	G	F	E	D	C	B	A



Operational Protocol

The device operates as a stand alone LED display. The integral driver is fed information in the correct bit format from the on board microcontroller. The controller handles the RS485 communication protocol with the host system. The host system must prepare the segment data that it will send to the display in order to illuminate the relevant segments that make up a character.

Since the device can be daisy chained each unit has a number of setting jumpers that set the address of the unit on the RS485 bus. The device will only capture the segment data that is destined for that unit. This is done by monitoring the address of the unit sent from the host controller. The host must send 5 bytes in order to update all of the 4 1/2 digits within a particular display. The format of the data is as follows:

D7	D6	D5	D4	D3	D2	D1	D0	
n/u	lead 1	sign	Add 4	Add 3	Add 2	Add1	Add 0	Address/half digit
dp	G	F	E	D	C	B	A	Digit 4
dp	G	F	E	D	C	B	A	Digit 3
dp	G	F	E	D	C	B	A	Digit 2
dp	G	F	E	D	C	B	A	Digit 1

Digit format is as follows:

Half Digit	Digit 4	Digit 3	Digit 2	Digit 1
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If D6 is 0 then the lead 1 is off, if D6 is 1 then the lead 1 is on.

If D5 is 0 then the - sign is shown, if D5 is 1 then the + sign is shown

The system is designed to work with a number of devices on the bus at the same time. This would cause a flickering effect if each were updated when all LED's were in the same field of view. To avoid this problem the devices do not update until the host sends the universal **UPDATE ALL** command. This is done by sending address **1Fh**. When this address is seen by the displays the data stored in the microcontroller from the bus will be transferred to the display driver chip. This means that the address **1Fh** cannot be used as an identifier **1Fh** (all jumper fitted should not be used

To set the address the jumpers need to be linked. The presence of a jumper set the relevant address matching bit to a logic 1. If all jumpers are removed then the address is 0.

Jumper address is as follows: Note the units are set to addresses 10h to 1Ah after test.

A0
A1
A2
A3
A4

Note that the +/- segments are inverted from each other. If one is off then the other is on and vice versa.

The communication protocol is set such that if the address matches then the device will expect to receive the remaining 4 digits data bytes. If the host loses communication then the display may hang. In order to recover from this situation it is recommended to send 5 bytes of 1Fh. This will force the displays into a known state from which they can be updated with the relevant data.

The communication bus has transorbs fitted in order to withstand electrical transients that can be present on long electrical lines. It is recommended that additional capacitance be included at the power supply header on the displays if the distance from the power source is greater than 10 metres. This does, to some extent, depend upon the impedance of the cables that are used. When the update command is given there can be a large transient on the bus as the LED's segments illuminate. This could cause the display microcontroller to reset if it takes the supply voltage outside of the allowable limits.