Tel +1 (717) 767-6511
Fax +1 (717) 764-0839
www.redlion.net

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MODEL PBLSP - APOLLO 4/6-DIGIT BCD SLAVE DISPLAY MODULE FOR USE WITH THE LARGE DIGIT DISPLAY (LDD)

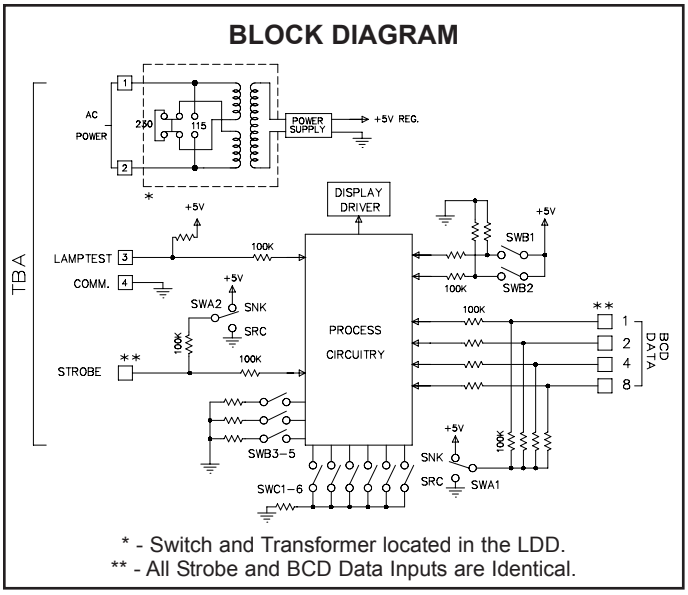
DESCRIPTION

The Model PBLSP Apollo Slave Display Module is a P.C. Board assembly that is to be installed in an RLC Large Digit Display product *(See LDD Bulletin)*. The module converts BCD data to numerical data for each digit of the LDD display. The BCD data can be supplied by various equipment such as programmable controllers, RLC Series 600 units, etc. The unit can display the numbers from 0 to 9 by sending the correct BCD information. Individual digits can be blanked by sending a Binary Code number greater than 9.

The PBLSP has three DIP Switch selectable decimal points for displaying in 10ths, 100ths and 1000ths. In addition, DIP switches allow a minus sign "-" to be displayed in any of the digit positions with the appropriate BCD input. This "-" may be used as a negative polarity indicator or as a separating dash between numeric information. Only one "-" may be displayed at any given time.

Other DIP Switches allow selection of positive or negative true logic and pull-up or pull-down resistors for both the Data and Strobe inputs. Individual Strobe inputs are provided for each digit to accommodate both multiplexed *(strobed)* and full parallel data input applications. The module is powered from either a 4-digit or a 6-digit LDD *(see Ordering Information)*.

BLOCK DIAGRAM



* - Switch and Transformer located in the LDD.
** - All Strobe and BCD Data Inputs are Identical.

SPECIFICATIONS

1. POWER REQUIREMENTS:

AC Operation - Switch selected via the LDD Power Supply Board, 115/230 VAC ±10%, 50/60 Hz, 10 VA for 4-digit and 15 VA for 6-digit (including LDD).

2. INPUT IMPEDANCE (ALL Inputs): 100 KΩ

3. INPUT TRIGGER LEVELS (ALL Inputs):

V_{IL} = 1.0 V, V_{IH} = 4.0 V, Max. input voltage = 28 VDC

4. INPUT DATA SCAN RATE: 100 KHz max.

5. OPERATING TEMPERATURE: 0°C to 50°C

6. STORAGE TEMPERATURE: -40°C to 70°C

7. WEIGHT: 0.4 lbs (0.18 Kg)

LOGIC TRUE LEVEL SELECTION

The PBLSP module has four DIP switch settings which insure compatibility with the hardware and logic convention of the output device *(programmable controller, etc.)*. The two position DIP switch SWA, configures the input circuitry to accept signals from sourcing or sinking outputs. This is done internally by connecting pull-up *(SNK)* or pull-down *(SRC)* resistors on all Data and Strobe inputs.

Positions 1 and 2 of DIP switch SWB select the Logic True Level of the BCD DATA and DIGIT STROBE inputs. SWB1 in the down (0) position selects a *"LOW" (Negative)* logic true level for the BCD Data Inputs. This means that the "1, 2, 4, or 8" data input lines must be pulled low to be active. For example, a BCD "9" code is entered by pulling the 1 and 8 data inputs low and then strobing that digit. SWB1 in the up (1) position selects a *"HIGH" (Positive)* logic true level and indicates that the lines must be pulled high to be active.

SWB2 in the down position selects a *"LOW" (Negative)* logic true level for the Strobe Inputs. This indicates those lines must be pulled low to allow data to be strobed in for the display. SWB2 in the up position selects a *"HIGH" (Positive)* logic true level, which requires the strobe lines be pulled high to strobe in data for the display.

FULL PARALLEL OPERATION

Full parallel operation requires the use of four separate BCD input lines per digit *(16 total data lines for 4-digit, 24 lines for 6-digit)*. The Digit Strobe terminals may or may not require external connections depending on whether the BCD data is constantly available at the data input terminals, or is multiplexed among more than one BCD input device. This leads to the two basic types of full parallel operation as described below.

FULL PARALLEL NON-MULTIPLEXED (Input Following) OPERATION

Full parallel non-multiplexed operation is used when the BCD information for each digit is constantly available at the Data Input terminals. In this mode of operation, the Strobe inputs are permanently set in their ACTIVE logic state via DIP switches and no external connections to the Strobe Inputs are required. With this set-up, any BCD data sent to the unit will be displayed immediately and the module's internal BCD latches will appear transparent to the input data.

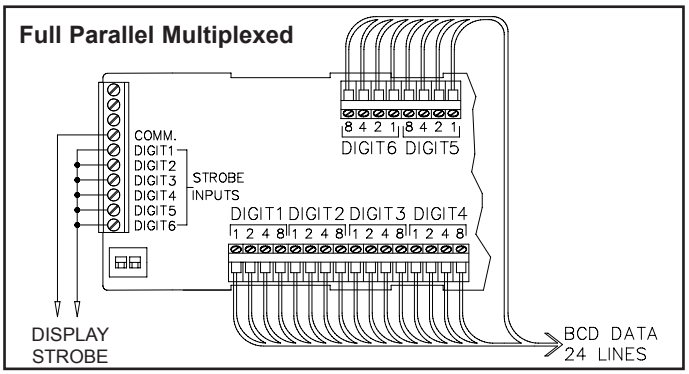
In setting the DIP switches for this mode, the *"DIGIT STROBES"* switch on SWA is set opposite to the *"DIGIT STROBES"* switch on SWB. This will internally set all digit strobes to a constantly ACTIVE logic state. The *"DATA INPUTS"* switches on SWA and SWB should both be set to the same position depending on the logic convention of the output device *(0 or 1)*.

FULL PARALLEL MULTIPLEXED OPERATION

Full parallel multiplexed operation normally occurs in systems which share the same BCD digit data lines among more than one Slave Display module or other BCD input devices *(See CASCADING DISPLAYS)*. All BCD data information is simultaneously available to each device in a BUS configuration, and only one device is activated at any given time through the use of strobe lines.

In this mode of operation, all the Digit Strobe terminals on a given module are wired together into a common *"Display Strobe"* line. For the Slave Display to function properly, the Display Strobe must be activated only when the respective BCD data for the module being strobed is present on the BCD Data Lines. The data is then stored in the module's internal BCD latches and constantly displayed until new information is strobed into the unit.

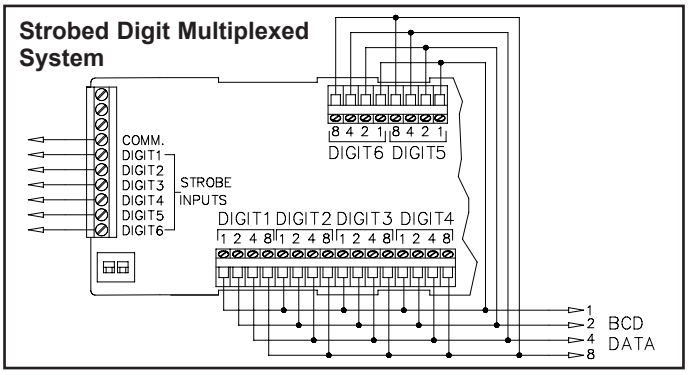
When setting the DIP switches for this mode, both *"DIGIT STROBES"* switches on SWA and SWB should be set to the same position *(0 or 1)* depending on the logic convention of the output device. In this manner, all digit strobes will be in a normally INACTIVE logic state and will only become ACTIVE when the Display Strobe line is toggled. The *"DATA INPUTS"* switches on SWA and SWB should both be set to the same position depending on the logic convention of the output device.



STROBED (Digit Multiplexed) OPERATION

Multiplexing BCD data lines for all the digits within a module requires a total of only four data lines, connected in parallel to each individual digit of the display *(all "1" bits tied together, all "2" bits tied, etc.)*. However, in this mode of operation a separate Digit Strobe line is needed for each digit. As each digit of BCD information is placed on the four data lines, the appropriate Digit Strobe line is activated to latch the data into the module. Each digit is successively strobed until the display has been fully updated. The data stored in the module's internal latches will be constantly displayed until new information is strobed in on one or more digits.

When setting the DIP switches for this mode, both *"DIGIT STROBES"* switches on SWA and SWB should be set to the same position *(0 or 1)* depending on the logic convention of the output device. In this manner, all digit strobes will be in a normally INACTIVE logic state and will only become ACTIVE as each individual Digit Strobe line is toggled. The *"DATA INPUTS"* switches on SWA and SWB should both be set to the same position depending on the logic convention of the output device.



CASCADING DISPLAYS

It is possible to *"share"* the 16/24 BCD Data lines *(16 lines for 4 digit, 24 lines for six digit)* among several Slave Display modules. To accomplish this, each Slave Display must have its data strobed in at different times, which requires multiplexed operation and a separate strobe line or lines for each module.

If data can be strobed into each display, four or six digits at a time *(full parallel multiplexed operation)*, only one strobe line is required for each additional unit cascaded. If only four BCD data lines are available from the output device *(digit multiplexed operation)*, they must be paralleled with the other digits and four or six strobe lines would be required for each additional Slave Display module.

The number of Slave Displays that can be cascaded *(i.e. BCD Data or Strobe Input lines per output)* is limited by the drive capabilities of the output device. The Slave Display module has a 100 K pull-up *(to +5 VDC)* or pull-down resistor on each BCD Data or Strobe Input when set up switches are in the SNK or SRC position respectively.

DIP SWITCH SET-UP

DIP SWITCH SWA: Input Hardware Configuration. These switch positions are normally set in the same direction as the corresponding DIP switch positions on SWB.

SWA1 DATA INPUTS SNK/SRC:

Connects an internal 100 K pull-up *(SNK)* or pull-down *(SRC)* resistor to each of the BCD Data Inputs.

SWA2 DIGIT STROBES SNK/SRC:

Connects an internal 100 K pull-up *(SNK)* or pull-down *(SRC)* resistor to each of the Digit Strobe Inputs.

SWB3: D.P. OFF/00000.0 - Tenths Decimal Point.
SWB4: D.P. OFF/0000.00 - Hundredths Decimal Point.
SWB5: D.P. OFF/000.000 - Thousandths Decimal Point.

DIP SWITCH SWB: Input Logic True Level and Decimal Point Selection.

SWB1 DATA INPUTS LOGIC TRUE LEVEL:

Selects Negative (0) or Positive (1) Logic True Level for all BCD Data Inputs.

SWB2 DIGIT STROBES LOGIC TRUE LEVEL:

Selects Negative (0) or a Positive (1) Logic True Level for all Digit Strobe Inputs.

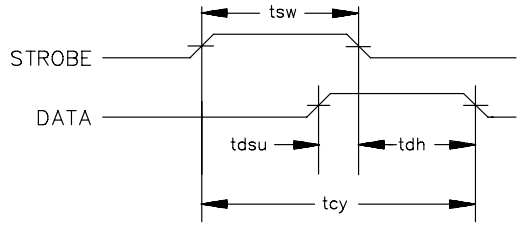
DIP SWITCH SWC: Minus Sign Selection.

SWC1 - SWC6:

Selects the Digit *(1-6)* in which a minus sign or dash may be displayed in place of numeric BCD data. A minus sign "-" will be displayed in the appropriate digit location when BCD bit "8" of the selected digit is in the ACTIVE logic state *(Regardless of the logic states of bits 1, 2, and 4)*. If bit "8" of the selected digit is in the INACTIVE logic state, the appropriate digit will be blank.

Note: ONLY ONE DIGIT MAY BE SELECTED TO DISPLAY A MINUS SIGN "-" AT ANY GIVEN TIME.

TIMING SPECIFICATIONS FOR STROBE & DATA INPUTS



tsw min.	=	5 µs (strobe pulse width)
tdsu min.	=	1 µs (data set-up time)
tdh min.	=	5 µs (data hold time)
tcy min.	=	10 µs (cycle time)
fscan max.	=	1/tcy min. = 100 KHz (scan rate)

Note: Specifications shown are based on a sourcing input with V_{IH} and V_{IL} levels equal to +5 VDC and 0 VDC respectively.

CONNECTIONS

POWER and DIGIT STROBES (TBA)

AC POWER:

AC Power connections are made at TBA #1 and TBA #2. For best results, the AC power should be relatively "clean" and within the specified +/-10% variation limits. Connecting the unit to power sources that are from heavily loaded circuits, or from circuits that also power loads that cycle on and off, should be avoided.

Note: Power should NOT be applied until all wiring is complete and the module is properly installed into the Large Digit Display (LDD).

LAMPTEST (LT):

Connecting terminal TBA #3 to "COMM." will light all segments on the display to verify proper illumination, regardless of any input or logic switch settings. Decimal points will NOT light via LAMPTEST, but can be individually turned on by using DIP switches SWB3, 4, & 5. LAMPTEST is intended primarily for troubleshooting and is generally not used during normal operation of the module.

COMMON:

TBA #4 is circuit common, to which all input voltage levels are referenced.

STROBE INPUTS:

The Strobe Inputs, TBA #5 through TBA #10, function as enable lines to latch information, into the module's display buffers, that is present on the BCD Data Input terminals. The Strobe Inputs may be configured to accept signals from sourcing or sinking output devices using DIP switch SWA2. In addition, Positive or Negative true logic for the Strobe Inputs may be selected using DIP switch SWB2.

BCD DATA INPUTS FOR DIGITS 1 through 4 (TBB):

The BCD Data Inputs, TBB #1 through TBB #16, accept standard 4-bit BCD information to be displayed in the corresponding digit location. Digit 1 is the Least Significant Digit of the display. Like the Strobe Inputs, the BCD Data Inputs are compatible with sourcing or sinking output devices using DIP switch SWA1 and will accept Positive or Negative true logic using DIP switch SWB1.

BCD DATA INPUTS FOR DIGITS 5 and 6 (TBC):

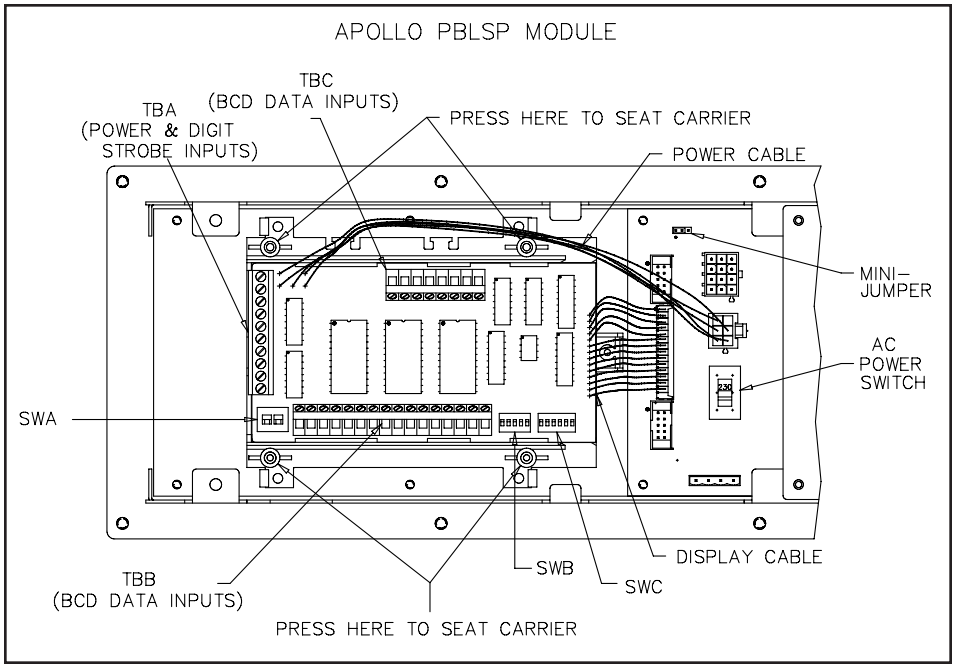
BCD Data Inputs, TBC #1 through TBC #8, are functionally the same as terminal TBB, for Digits 5 and 6. For applications using a 4-digit LDD, these terminals will NOT be used and should be left disconnected.

INSTALLATION

The Model PBLSP Apollo Slave Display Module is a P.C. Board Assembly that is to be installed into an RLC 6-digit or 4-digit Large Digit Display *(See LDD Bulletin)*. To place the PBLSP Module into the LDD, first remove the rear cover by unscrewing the two captive fasteners. Place the PBLSP Module on the plastic standoffs. Push on the four posts until the carrier snaps into place.

Note: Power should NOT be applied until all wiring is complete AND the module is properly installed into the Large Digit Display (LDD).

Select the proper voltage by setting the switch on the Large Digit Display to either 115 or 230 VAC. Connect the display and power cables on the module to the appropriate connectors on the power supply board *(see drawing below)*.



ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
PBLSP	Apollo BCD Slave Display Module for use with 4-digit Large Digit Display or 6-digit Large Digit Display	PBLSP600

Red Lion Controls
20 Willow Springs Circle
York PA 17402
Tel +1 (717) 767-6511
Fax +1 (717) 764-0839

Red Lion Controls BV
Basicweg 11b
NL - 3821 BR Amersfoort
Tel +31 (0) 334 723 225
Fax +31 (0) 334 893 793

Red Lion Controls AP
31, Kaki Bukit Road 3,
#06-04/05 TechLink
Singapore 417818
Tel +65 6744-6613
Fax +65 6743-3360