

MODEL PBLT - LDD 4/6 - DIGIT TOTALIZING COUNTER MODULE



DESCRIPTION

The Model PBLT Apollo Totalizing Counter Module is a P.C. board assembly designed to be installed in an RLC Large Digit Display product (see LDD Bulletin). The module is a versatile totalizing counter that can be adapted to a wide variety of counting, measuring, and positioning readout applications. The Model PBLT features non-volatile memory, various control inputs, wide variety of sensor acceptance, and high count rate (10 KHz). The PBLT uses the RLC standard programmable count input circuit. This input circuit accepts count pulses from all RLC sensors and from most other available sensors. It also accepts switch contact, variable resistance, voltage or current level signals as well as outputs from TTL and CMOS circuits.

The selection of control inputs provides an additional degree of application flexibility. These control inputs allow the Model PBLT to be used in a variety of specialized measuring applications that go well beyond routine counting. The PBLT totalizer can be used as a stand-alone counter or as a system component with other RLC counters and/or accessory items to provide complex counting, timing, and control functions not available in any single instrument.

The PBLT has an internal non-volatile memory device which eliminates the need for battery back-up. When AC power is lost, this device will maintain all data necessary for system operation. This module also has a self-test feature which is activated during power-up (*self-test DIP switch must be enabled*).

Power and input connections are made via a removable terminal strip located at the rear of the module. This strip can accept one #14 AWG wire. DIP switches at the side of the module are used to program the input configuration.

SPECIFICATIONS

1. POWER REQUIREMENTS:

AC Operation: Switch selected via the LDD power supply board, 115/230 ($\pm 10\%$), 50/60 Hz, 10 VA for 4-digit, 15 VA for 6-digit (*including LDD*).

2. SENSOR POWER: +12 VDC ($\pm 25\%$) @ 100 mA max.

3. COUNT INPUT: Switch selectable to accept count pulses from a variety of sources, including switch contacts, output from CMOS or TTL circuits, and all standard RLC sensors.

Current Sourcing: Module provides 3.9 K Ω pull-down load for sensors with current sourcing outputs. (*Max. input voltage, 28 VDC @ 7 mA.*)

Current Sinking: Module provides 7.8 K Ω pull-up load for sensors with current sinking outputs. (*Max. sensor current, 1.6 mA.*)

Debounce: Damping capacitor provided for switch contact debounce. Limits count speed to 100 Hz max. and input pulse widths to 5 msec. min.

Lo Bias: Input Trigger Levels $V_{IL} = 1.5$ V, $V_{IH} = 3.75$ V.

Hi Bias: Input Trigger Levels $V_{IL} = 5.5$ V, $V_{IH} = 7.5$ V.

Note: Bias levels $\pm 10\%$ @ 12 VDC sensor voltage. These levels vary proportionally with sensor supply voltage.

4. MAXIMUM COUNT RATE:

High Frequency: 10 KHz max. for all electronic sensors. Signal must be square wave inputs.

Low Frequency: 100 Hz for switch contact closure. *Note: Module will operate with VCM [E-H] modules.*

5. CONTROL INPUTS:

Up/Down Control: Active low ($V_{IL} = 1.5$ V max.), internally pulled up to 5 VDC through a 10 K Ω resistor ($I_{SNK} = 0.5$ mA). Response time = 50 μ sec. This input determines the direction of the count. When it is at +5 V, the module will count up. When this terminal is at a low (*zero volts*), the module will count down.

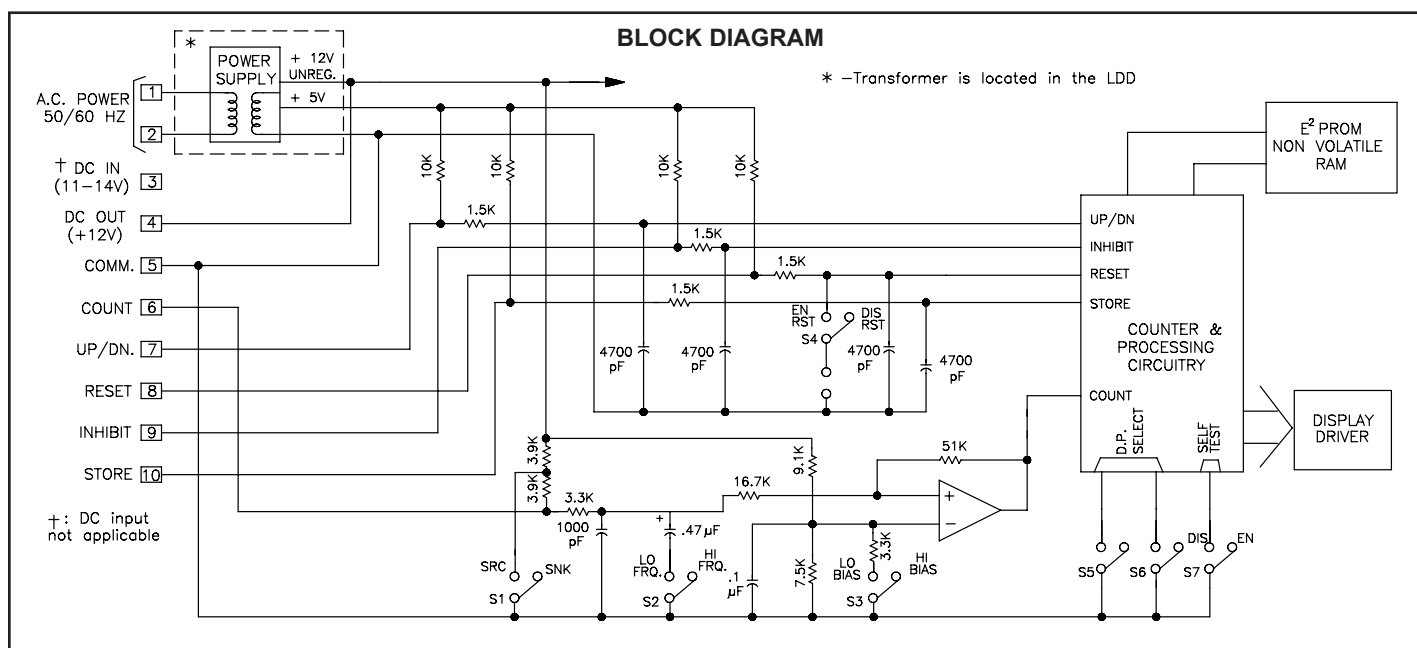
Remote Reset: Active low ($V_{IL} = 1.5$ V max.), internally pulled up to 5 VDC through a 10 K Ω resistor ($I_{SNK} = 0.5$ mA). Response time = 10 msec. A low will stop the display from updating. When the voltage goes back to +5 VDC, the display is reset to zero.

Inhibit: Active low ($V_{IL} = 1.5$ V max.), internally pulled up to 5 VDC through a 10 K Ω resistor ($I_{SNK} = 0.5$ mA). Response time = 50 μ sec. A low will prevent the module from counting.

Store: Active low ($V_{IL} = 1.5$ V max.), internally pulled up to 5 VDC through a 10 K Ω resistor ($I_{SNK} = 0.5$ mA). A low will stop the display from updating. When the voltage level goes back to +5 V, the display will show the current count value.

6. MEMORY RETENTION: Uses a "no power E²PROM", which maintains all information when the power is removed. Life expectancy of this device is at least 10,000 power down cycles, and the length of memory retention for a single power down can be as long as 10 yrs.

7. INPUT AND POWER CONNECTIONS: Via a plug-in compression type, barrier strip. This strip can be removed from the module for ease of wiring. After wiring is complete, the connector can be plugged back into the module.



8. CERTIFICATIONS AND COMPLIANCES:

SAFETY

IEC 1010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.

IP65 Enclosure rating (Face only), IEC 529

Type 4 Enclosure rating (Face only), UL50

EMC EMISSIONS:

Meets EN 50081-2: Industrial Environment.

CISPR 11 Radiated and conducted emissions

EMC IMMUNITY:

Meets EN 50082-2: Industrial Environment.

ENV 50140 - Radio-frequency radiated electromagnetic field

ENV 50141 - Radio-frequency conducted electromagnetic field

EN 61000-4-2 - Electrostatic discharge (ESD)

EN 61000-4-4 - Electrical fast transient/burst (EFT)

EN 61000-4-8 - Power frequency magnetic field

Note: Refer to the EMC Installation Guidelines section of this bulletin for additional information.

9. **OPERATING TEMPERATURE RANGE:** 0°C to 50°C.

10. **STORAGE TEMPERATURE RANGE:** -40°C to 70°C.

11. **WEIGHT:** 0.4 lbs.

INPUT SET-UP

The selection of input set-up is accomplished by the first four of seven DIP switches, located along the side of the module. DIP switches 1 to 3 are used to configure the input. Each switch is discussed below.

S1 - Snk: Provides a 7.8 KΩ pull-up resistor for sensors with sinking outputs.

Src: Provides a 3.9 KΩ pull-down resistor for sensors with sourcing outputs.

S2 - Hi Frq: Removes damping capacitor and allows operation up to the high speed count specification.

Lo Frq: Connects damping capacitor for switch contact de-bounce. Limits count speed to 100 Hz. with 50% duty cycle.

S3 - Hi Bias: Sets input trigger levels at mid-range, to accept outputs from 2-wire proximity sensors, resistive photocells, and logic pulses with full 0 to +12 V swings. ($V_{IL} = 5.5 \text{ V}$, $V_{IH} = 7.5 \text{ V}$)

Lo Bias: Sets inputs trigger levels to the low range, to accept logic pulses with 0 to +5 swings. ($V_{IL} = 1.5 \text{ V}$, $V_{IH} = 3.75 \text{ V}$)

S4 - Not Applicable

POWER-UP DIAGNOSTICS

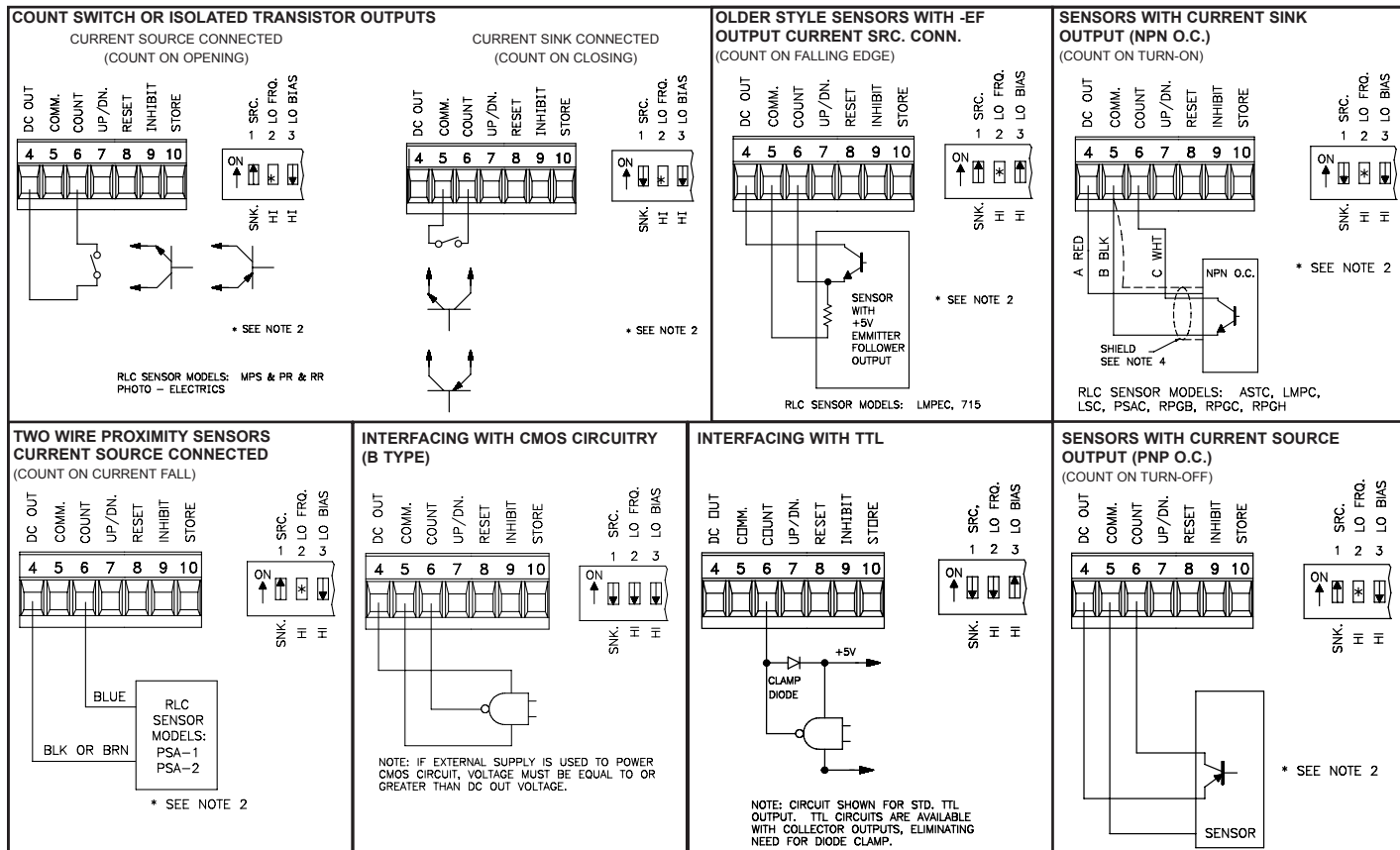
Upon applying power, the PBLT performs an internal self-diagnostic test of the stored data. If the tests do not agree, an "E" appears on the right side of the display. The unit must be reset before normal operations can continue. If the error persists, replace the unit.

DECIMAL POINT SELECTION

The selection of decimal point is accomplished by DIP switches 5 and 6. The table at right shows what combination of switches is needed to obtain the desired decimal point location. The module always has leading zero blanking.

SW 5	SW 6	D.P. LOCATION
↓ (0)	↓ (0)	0
↓ (0)	↑ (1)	0.0
↑ (1)	↓ (0)	0.00
↑ (1)	↑ (1)	0.000

CONNECTIONS & CONFIGURATION SWITCH SET-UP FOR VARIOUS SENSOR OUTPUTS



NOTES:

1. SENSOR SUPPLY VOLTAGE AND CURRENT

The +12 V sensor supply voltage on the "DC OUT" Terminal is nominal with $\pm 25\%$ variation due to line and internal load variations. All RLC sensors will accommodate this variation.

2. HI/LO FRQ. SELECTION

The "HI/LO FRQ." Selection switch must be set on "LO FRQ." when switch contacts are used to generate count input signals. Since the "LO FRQ." mode also provides very high immunity against electrical noise pickup, it is recommended that this mode also be used, whenever possible, with electronic

sensor outputs, as added insurance. The "LO FRQ." mode can be used with any type of sensor output, provided count pulse widths never decrease below 5 milliseconds, and the count rate does not exceed 100 cps.

3. V_{IL} and V_{IH} levels given are nominal values $\pm 10\%$ when counter voltage on "DC OUT" Terminal is +12 VDC. These nominal values will vary in proportion to the variations in "DC OUT" Terminal voltage, caused by line voltage and load changes.

4. When shielded cable is used, the shield should be connected to "COMM." at the counter and left unconnected at sensor end.

SELF-TEST

There is a built-in self-test feature which can only be activated immediately after power-up (*the module will not count while in self-test*). To activate self-test, set the self-test DIP switch (*number 7*) to the enable position. Then power the module up. With this test, all digits are cycled through starting with a string of all zeros. This will be shown for about half a second, then a string of ones will appear for about the same time duration. Following these, a string of twos and so on, up to nines will be displayed. After the nines are shown, a string of decimal points will appear. Next, an interlace pattern of 1, 0, 1, 0, 1, 0, then 1, 2, 1, 2, 1, 2, and so on until all digits from zero to nine have been displayed.

The next portion of self-test will display a group of ones and/or zeros.

Digit 8 (MSD)	= N/A
7	= N/A
6	= 1 if STORE is pulled low
5	= 1 if INHIBIT is pulled low
4	= 1 if UP/DN is pulled low
3	= 1 if RESET is pulled low
2	= 1 if DIP switch 6 is ON
1 (LSD)	= 1 if DIP switch 5 is ON

INPUT & POWER CONNECTIONS

There is a terminal block where all wiring connections are made. Remove the terminal block for easy access to the terminal screws. To remove the terminal block, pull from the back of the block until it slides clear of the terminal block shroud.

Terminals 1 and 2 are the primary AC power terminals (located on the left-hand side of the block). CAUTION: Power should NOT be applied until the terminal block is plugged into the module AND the module is properly installed into the Large Digit Display (LDD). For best results, the AC power should be relatively “clean” and within the specified $\pm 10\%$ variation limits. Drawing power from heavily loaded circuits, or from circuits that also power loads that cycle on and off, should be avoided.

Terminal 4 is the “DC OUT” (+12 V) terminal. This is for sensor supply and can provide up to 100 mA of current.

Terminal 5 is the “COMM.” (Common) terminal, which is the common line to which the sensor and other input commons are connected.

Terminal 6 is the “COUNT” (Count Input) terminal. When the signal at this terminal is pulled low (Zero volts), a count will be registered. (See “Count Input Rates” under Specifications section.)

Terminal 7 is the “UP/DN” (Count Direction Control) terminal. When this terminal is at a high level, the count direction is “UP”. When the terminal is grounded, the count direction is “DOWN”.

Terminal 8 is the “REM. RST.” (Remote Reset) terminal. When this terminal is at a low level (connected to COMMON), the unit will stop updating. When the voltage goes back to +5 VDC, the display will reset to zero.

Terminal 9 is the “INHIBIT” terminal. When this terminal is at a low level (connected to COMMON), the unit will not register any counts.

Terminal 10 is the “STORE” terminal. When this terminal is at a low level (connected to COMMON), the unit will stop updating the display (latch). Counting will continue. When the terminal goes back high, the display will update to the latest count value.

Note: Enclosed with the module is an adhesive backed label(s) showing the terminal block pin-out. This label(s) may be applied where the user desires.

EMC INSTALLATION GUIDELINES

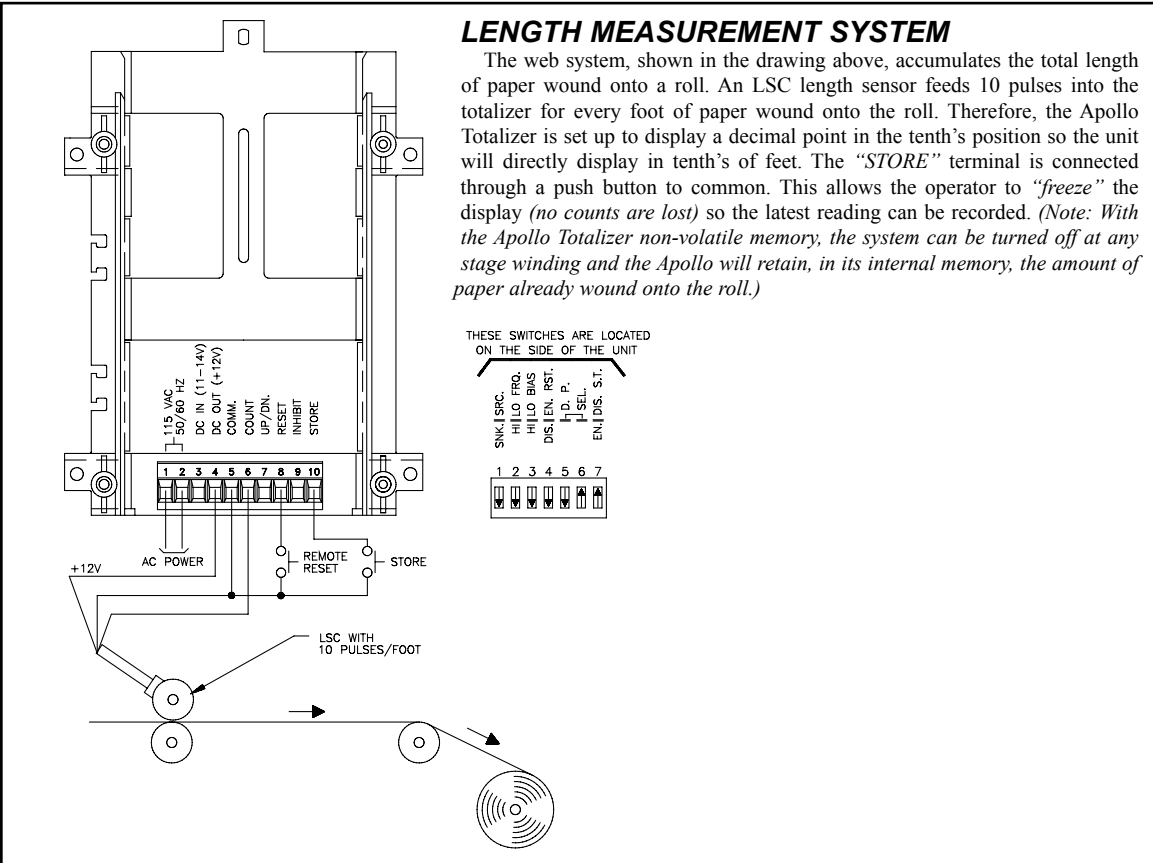
Although this unit is designed with a high degree of immunity to ElectroMagnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the unit may be different for various installations. The unit becomes more immune to EMI with fewer I/O connections. Cable length, routing and shield termination are very important and can mean the difference between a successful or a troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The LDD unit should be mounted in a metal panel, that is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
 - a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
 - b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
 - c. Connect the shield to common of the unit and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:

Ferrite Suppression Cores for signal and control cables:
Fair-Rite # 0443167251 (RLC #FCOR0000)
TDK # ZCAT3035-1330A
Steward #28B2029-0A0

Line Filters for input power cables:
Schaffner # FN610-1/07 (RLC #LFIL0000)
Schaffner # FN670-1.8/07
Corcom #1VR3

Note: Reference manufacturer's instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.



TROUBLESHOOTING

For further technical assistance, contact technical support at the appropriate company numbers listed.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
PBLT	LDD 4/6-Digit Totalizer Module	PBLT0600

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