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Bulletin No. MDMU-F
Drawing No. LP0391
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MODEL MDMU - MINIATURE DISPLAY MODULE COUNTER/TIMER

- *LCD, POSITIVE REFLECTIVE OR NEGATIVE TRANSMISSIVE WITH YELLOW/GREEN OR RED BACKLIGHTING*
- *COUNTER & TIMER ALL IN A SINGLE UNIT*
- *COUNT POSITIVE OR NEGATIVE EDGE*
- *9 RANGES IN TIMER MODE*
- *SELECTABLE DECIMAL POINTS*
- *5 VDC POWERED*
- *PANEL MOUNT OR PC BOARD MOUNT*

DESCRIPTION

The MDMU is a complete 6 digit Counter/Timer in a small panel or printed circuit board mounted package. It is designed to operate from a 5 VDC power supply. It has a 6 digit LCD, with 0.35" high digits, and 3 selectable decimal points. In the timer modes, a flashing annunciator is supplied to indicate that the signal input of the MDMU is active. The displays are available in positive image reflective (black digits, reflective background) or negative image transmissive (illuminated digits, dark background) with red or yellow/green backlighting.

The MDMU has four Mode Select and two Decimal Point Select inputs available for determining the basic operation. In most applications, the MS and DP inputs are hard wired to select the appropriate function (counter or timer) and counter decimal point position.

The COUNTER mode is selected by setting the Mode select inputs to the appropriate levels (Hardware selection). Decimal points may also be set using the DP Inputs (Hardware selection).

The TIMER mode and range is selected by setting the Mode Select inputs to the appropriate levels (Hardware selection). The timing range increments available are 1 msec, 10 msec, 100 msec, 1 sec, 0.1 min, 1 min, 0.01 hr, 0.1 hr, and 1 hr. The TIMER ACTIVE annunciator will flash at a 1 Hz rate when the input to the timer is activated.

CAUTION

This device contains CMOS circuitry which requires special anti-static handling to the same degree required by standard CMOS integrated circuits. Units should be stored in the conductive package used to ship the device. Containers should be opened and units handled only on a conductive table top by personnel wearing wrist-strap grounding equipment. These devices have the same protection circuits as standard CMOS devices to prevent damage to inputs due to nominal over-voltage.

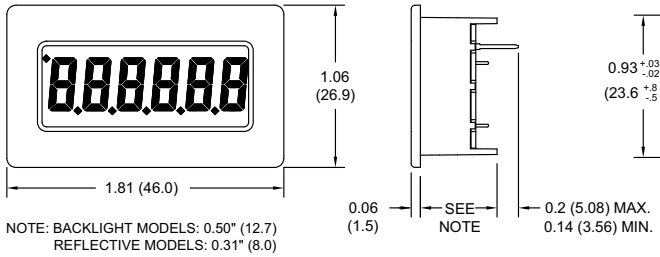
SPECIFICATIONS

1. **DISPLAY**: 6 Digit LCD, 0.35" (8.89 mm) high characters, available in positive image reflective (black digits, reflective background) or negative image transmissive (illuminated digits, dark background) with red or yellow/green backlighting.
2. **POWER REQUIREMENTS**:
   Reflective Versions: 5.0 VDC ±10% 100 µA max.
   Backlight Versions: 5.0 VDC ±10% 25 mA max.
3. **DECIMAL POINTS**:
   Timer: Determined by the timing mode selected.
   Counter: 3 programmable positions.

DIMENSIONS
In inches (mm)

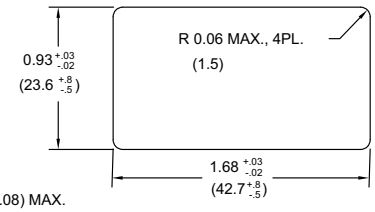
Note: Recommended minimum clearance behind the panel for mounting clip installation is 2.25" (57.2)W x 1.5" (38.1)H

PANEL MOUNT UNIT

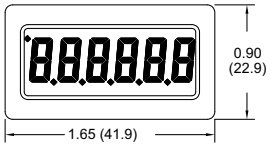


NOTE: BACKLIGHT MODELS: 0.50" (12.7)
REFLECTIVE MODELS: 0.31" (8.0)

PANEL CUT-OUT

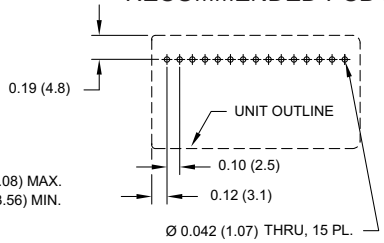


PRINTED CIRCUIT BOARD MOUNT UNIT



NOTE: BACKLIGHT MODELS: 0.56" (14.2)
REFLECTIVE MODELS: 0.37" (9.4)

RECOMMENDED PCB LAYOUT



4. **ANNUNCIATOR**: Flashes at a 1 Hz rate in the Timer mode when the signal input (CNT) is activated.
5. **CONSTRUCTION**: High impact black plastic case (mounting clip included with panel mount models).
6 **RELATIVE HUMIDITY**: Less than 85% RH (non condensing)
7. **WEIGHT**:
   Reflective Panel Mount: 0.275 oz (7.26 g)
   Reflective PCB Mount: 0.26 oz (6.8 g)
   Transmissive Panel Mount: 0.38 oz (10.43 g)
   Transmissive PCB Mount: 0.356 (9.75 g)

MAXIMUM RATINGS

RATING	SYMBOL	VALUE	UNITS
DC Supply Voltage	V_{DD}	5.5	VDC
Input Voltage, all inputs	V_{IN}	-0.5 to (V_{DD} +0.5)	VDC
Operating Temperature	T_A	-35 to +85	°C
Storage Temperature	T_{STG}	-40 to +85	°C

ELECTRICAL SPECIFICATIONS - V_{DD} = 5.0 VDC = ±10% @ 25 °C unless otherwise specified.

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	NOTES
V_{DD}	Supply Voltage	4.5	5.0	5.5	VDC	Voltages outside these parameters may cause display problems
I_{DD}	Supply Current - Transmissive		20	25	mA	V_{DD} = 5.0 VDC - 10 KHz Counting Rate.
I_{DD}	Supply Current - Reflective		50	100	µA	V_{DD} = 5.0 VDC - 10 KHz Counting Rate.
V_{IH}	Valid High Voltage	3.0			VDC	
V_{IL}	Valid Low Voltage			1.5	VDC	
I_{IN}	Input Leakage Current		0.1	1.0	µA	
Fc	Count Frequency - CNT			9.9	KHz	50% Duty cycle
$T_{R,L}$	RST, LATCH Pulse Width	30			µsec	
A_{CCTB}	Time Base Accuracy			0.025	%	

INSTALLATION

The MDMUs are available in either a panel mount or printed circuit board mount design. The panel mount units are provided with a mounting clip to securely hold the unit in the panel cutout.

Panel Mount Installation:

1. Cut panel opening to specified dimensions. Remove burrs and clean the panel opening.
2. Install MDMU through the panel cutout as shown in Figure 1.
3. Slide mounting clip over rear of unit until clip is against the back of panel. The unit has slots for the locking tabs to hold it in the panel opening.

Note: Hold the MDMU front bezel in place when sliding the mounting clip in to position

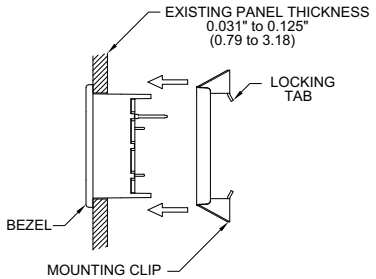


Figure 1

PCB Mount Installation:

1. Prepare printed circuit board hole pattern to the specifications.
2. Unit should be hand soldered using good soldering techniques and hand cleaned if necessary.

WIRING CONNECTIONS

The electrical connections are made via terminal pins located on the back of the unit. The terminal pins are on 0.100" center lines and can be mated with the RLC Model HWK7 cable assembly or many standard 0.100" center line connectors. When wiring the unit, refer to Figure 2 to identify the wire position with the proper function.

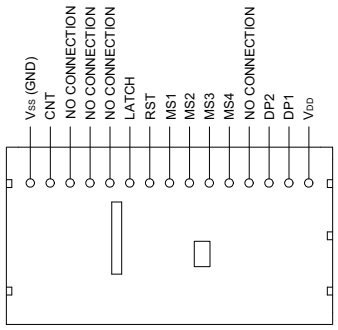


Figure 2

There are certain considerations that should be observed when running the signal wires. A length of wire can act like an antenna, and the closer it is to a source of electrical noise, the more it becomes susceptible to that noise.

These are a few rules that should be followed when running these wires.

1. Never run signal wires in the same conduit or raceway with A.C. power lines, conductors feeding motors, solenoids, SCR controls, heaters, etc.
2. Signal wires within enclosures should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
3. When shielded wire is used, connect the shield to the common of the MDMU unit, and leave the other end of the shield disconnected and insulated from machine ground.
4. Connect common of the MDMU to machine ground at one point only.

PIN DESCRIPTIONS

(All inputs are Schmidt trigger inputs)

V_{DD}: +5 VDC power
V_{SS}: GND or common supply terminal
DP1 & DP2: Counters - See Decimal Point Configuration Chart
Timers - Tie low
MS1-MS4: See Mode Select Inputs Chart
RST: Active low, will reset the display to zero
LATCH: Counters - A HIGH level will freeze the display, a LOW level will allow the counter to update the display normally
Timers - Tie low
CNT: Counters - This is the count input (edge trigger determined by mode)
Timers - This is the run input (active low = timer runs)

DECIMAL POINT CONFIGURATION CHART

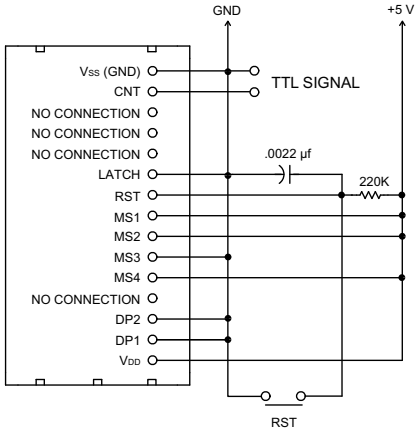
DP2	DP1	DISPLAY
0	0	0
0	1	0.0
1	0	0.00
1	1	0.000

MODE SELECT INPUTS CHART

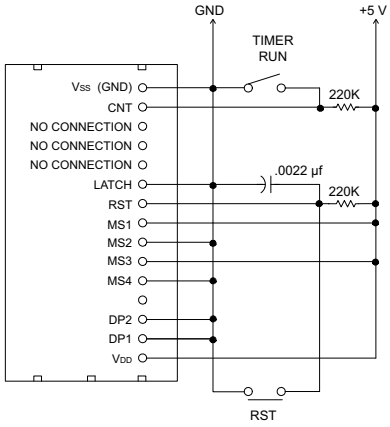
MODE	MS4	MS3	MS2	MS1	MODE OF OPERATION
0	0	0	0	0	0.001 Second Timer
1	0	0	0	1	0.01 Second Timer
2	0	0	1	0	0.1 Second Timer
3	0	0	1	1	1 Second Timer
4	0	1	0	0	0.1 Minute Timer
5	0	1	0	1	1 Minute Timer
6	0	1	1	0	0.01 Hour Timer
7	0	1	1	1	0.1 Hour Timer
8	1	0	0	0	1 Hour Timer
9	1	0	0	1	DO NOT USE
10	1	0	1	0	Negative Edge Counter
11	1	0	1	1	Positive Edge Counter
12	1	1	0	0	DO NOT USE
13	1	1	0	1	DO NOT USE
14	1	1	1	0	DO NOT USE
15	1	1	1	1	DO NOT USE

TYPICAL APPLICATIONS

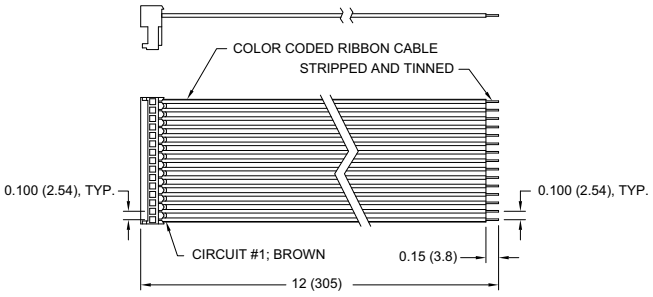
COUNTER - TTL signal input counting. Positive edge incrementing (leading edge).



1 MINUTE TIMER - With Leading Zero Blanking enabled. Time starts with the switch closed. Time stops and holds the display with the switch open.



ACCESSORY: MDM CABLE ASSEMBLY - HWK70000



ORDERING INFORMATION

MODEL NO	DESCRIPTION	PART NUMBER
MDMU	Panel Mount W/Reflective Display	MDMU0000
	Panel Mount W/Yel-Grn Backlighting	MDMU0010
	Panel Mount W/Red Backlighting	MDMU0020
	PC Board Mount W/Reflective Display	MDMU0100
	PC Board Mount W/Yel-Grn Backlighting	MDMU0110
	PC Board Mount W/Red Backlighting	MDMU0120
HWK7	MDM Cable Assembly	HWK70000

LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

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