

**American LED-gible®**

Reducing Downtime Across the Nation!

## The PPM Series Production Pacing Metronome

Owners Manual

HH:MM:SS, HH:MM, MM:SS, MMMM, SSSS, Firmware PP-2110-362B



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Manual PB-2149-399

Revision B

October 4, 2005



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## 1.0 Getting Started

Thank you for your purchase of an AMERICAN LED-gible® product. We take pride in the equipment we build, and we appreciate your support. We will do everything we can to keep you happy with your purchase for many years to come. Please review this manual carefully, and if you have any questions, call, e-mail, or fax us and we will be glad to help you. American LED-gible support can be reached at:

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1776 Lone Eagle St.  
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## 1.1 Product Description

The Production Pacing Metronome (PPM) is a special purpose numeric marquee system designed to pace the production rate of manual processes with long Takt times. PPM systems may be purchased with numeric displays ranging from 2.3" tall to 8" tall with HH:MM:SS, HH:MM, MM:SS, MMMM, SSSS, MMM, MM.M, and SSS display formats available. 2.3" tall digits are legible from as far away as 125 feet, 4.0" tall digits are legible from as far away as 200 feet, and 8" tall digits are legible from as far away as 400 feet. In most cases the display portion of the system is in a separate enclosure from the operator keypad, however in some cases the numeric display, and the operator keypad may be integrated into a single unit.

There are hundreds of possible combinations of display height and format, two of which are shown bellow. An eight inch tall, three digit MM.M PPM is shown on the left. An four inch tall, six digit HH:MM:SS PPM is shown on the right.



# Production Pacing Metronome Owners Manual



Using the keypad, the system operator programs the takt time into the PPM and starts the PPM timing down. When the PPM reaches zero, an audible alarm sounds for 2 seconds which signals the completion of the production cycle. The PPM can be programmed to pause at zero until the system operator manually resets the system, or the PPM can be programmed to reset itself to the takt time and begin timing down again automatically.

In addition to the two second production completion alarm, the PPM can optionally be programmed to sound up to two warning alarms at operator specified times. The 1<sup>st</sup> warning alarm sounds for 1/2 of a second, and the 2<sup>nd</sup> warning alarm sounds for 1 second. The different alarm lengths, 1/2, 1, and 2 seconds, serve to make the audible alarms uniquely identifiable by hearing alone. The warning alarms may be disabled by setting the warning times to zero.

The PPM also supports pausing or holding the timer during breaks. While the PPM is held, the displayed time will not decrement. When the hold is canceled, the PPM will continue to time down normally. To hold the PPM during breaks, press the HOLD button on the keypad, or apply 24V to the HOLD logic input. When the break is over, press the RUN button on the keypad, or remove 24V from the HOLD logic input.

To help explain PPM operation, consider the following example: Imagine Widget Co. wishes to manufacture 12 widgets during each eight hour shift, and would like warning alarms when 15 and 5 minutes remain in the production cycle. Widget Co. would program the PPM for a 40 minute takt time (8 hour shift without breaks divided by 12), program the 1<sup>st</sup> warning for 15 minutes, program the 2<sup>nd</sup> warning for 5 minutes, and configure the PPM to auto reset at the end of the cycle. With this configuration, the PPM will time down from 40 minutes to 0, sounding alarms at 15, 5, and 0 minutes. Then the PPM would automatically reset itself to 40 minutes and repeat the cycle again.

The PPM system is constructed by combining an AB-1194-501 processor board (PPM Processor), and a serial numeric display. Typically the PPM processor board is located in a separate control box as shown in the pictures on the previous page. However in some cases the PPM processor may be integrated into the numeric display enclosure. In both cases, the PPM processor controls the numeric displays via an RS-485 communications link. All of the PPM logic is implemented in the PPM processor board. The display section simply shows the number sent to it from the PPM processor board.

The display section of the PPM system is constructed using standard ALI Trimline or Econoline display technology. Since the PPM processor board can be used with many different numeric marquees, the display section of the PPM system will not be covered in detail in this manual.

For detailed information on the numeric display portion of the system, see the manual that came with the display. The part number for standard Trimline serial display manual is PB-2149-320. The part number for the standard Econoline serial display manual is PB-2149-240.

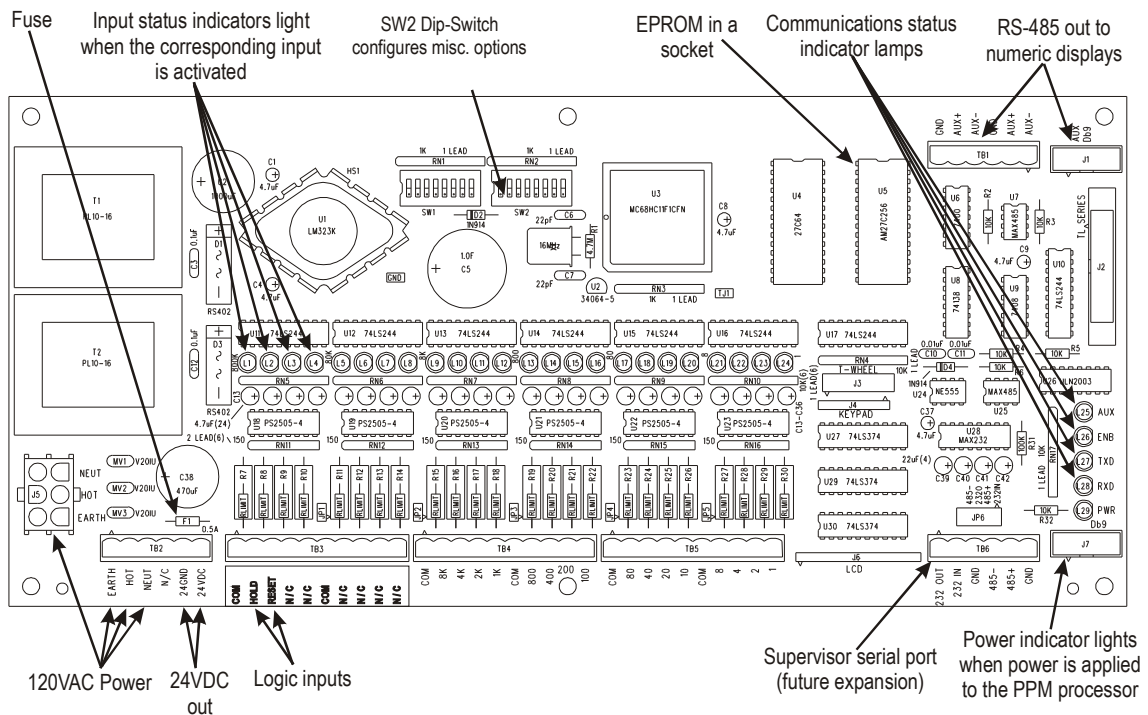
## 1.2 Unpacking the Unit

Every PPM is carefully tested, both mechanically and electrically, before shipment. Inspect the system for damage, which may have occurred in transit. If there is evidence of damage or the PPM fails to operate, file a claim with the shipper and notify American LED-gible.® Save the shipping materials for inspection.

If there are no signs of damage, carefully remove the PPM from the shipping carton. Then mount, hang, or set the display marquee in a location where the unit is readily visible. Mount the control box in a location where the system operator can easily use the keypad while observing the display marquee. When the system operator is modifying PPM registers, the number being entered is displayed on the marquee.

## 1.3 The PPM Processor Board

Before proceeding with system wiring, please take a few moments to become familiar with the PPM processor board shown in the diagram below.



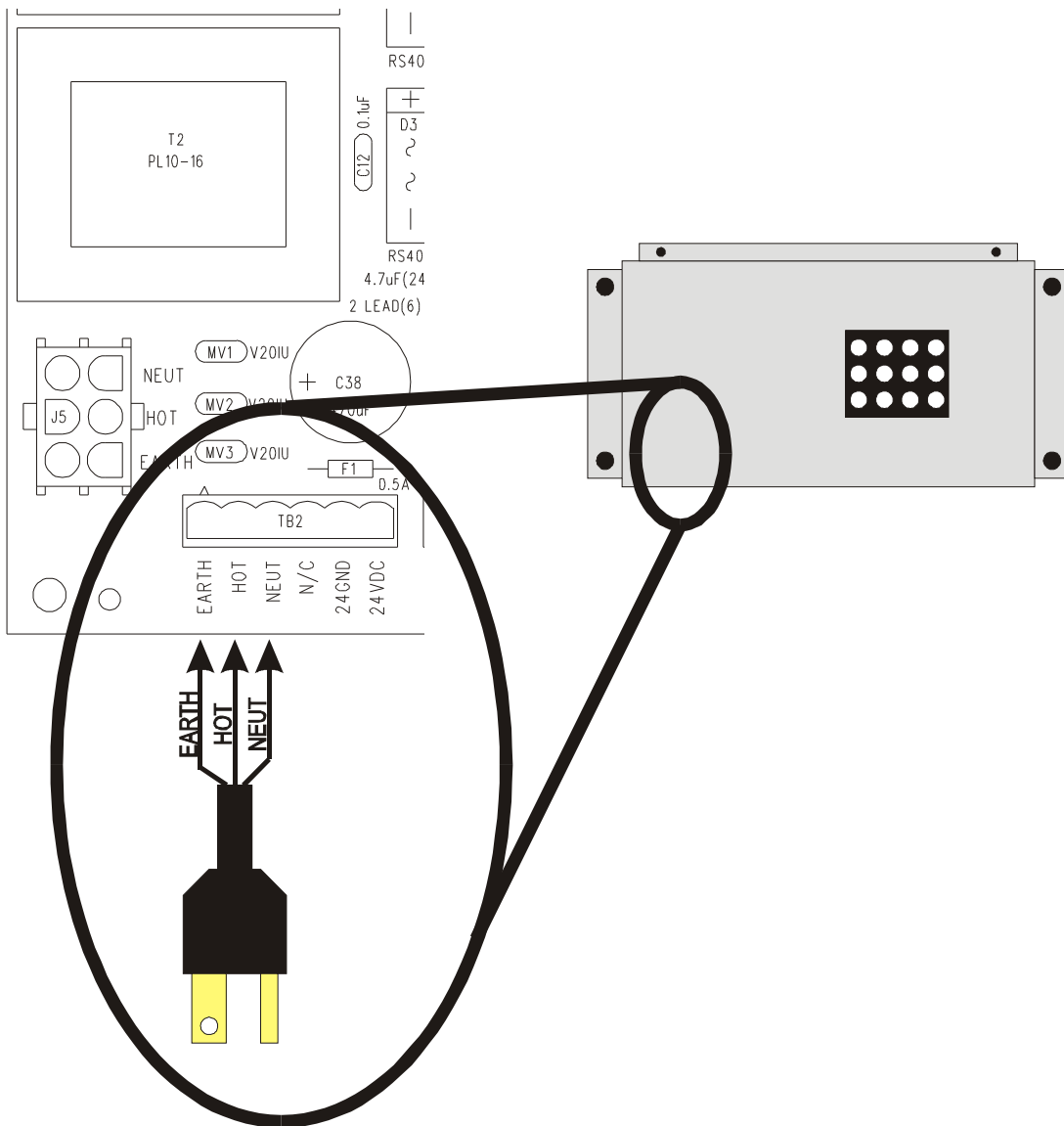
# Production Pacing Metronome Owners Manual



## 1.4 Installing Power Wiring

Both the numeric display marquee and the control box require 120VAC power. Consult the display manual for detailed instructions on installing 120VAC power wiring. 120VAC power wiring for the PPM control box is shown below.

Screw terminals for 120VAC power are provided within the PPM control box. Connect 120VAC power to the control box screw terminals as shown below. 120VAC Power wires should be American Wire Gauge #16 with a 600 volt insulation rating. The maximum power draw for the PPM control box is 20W.

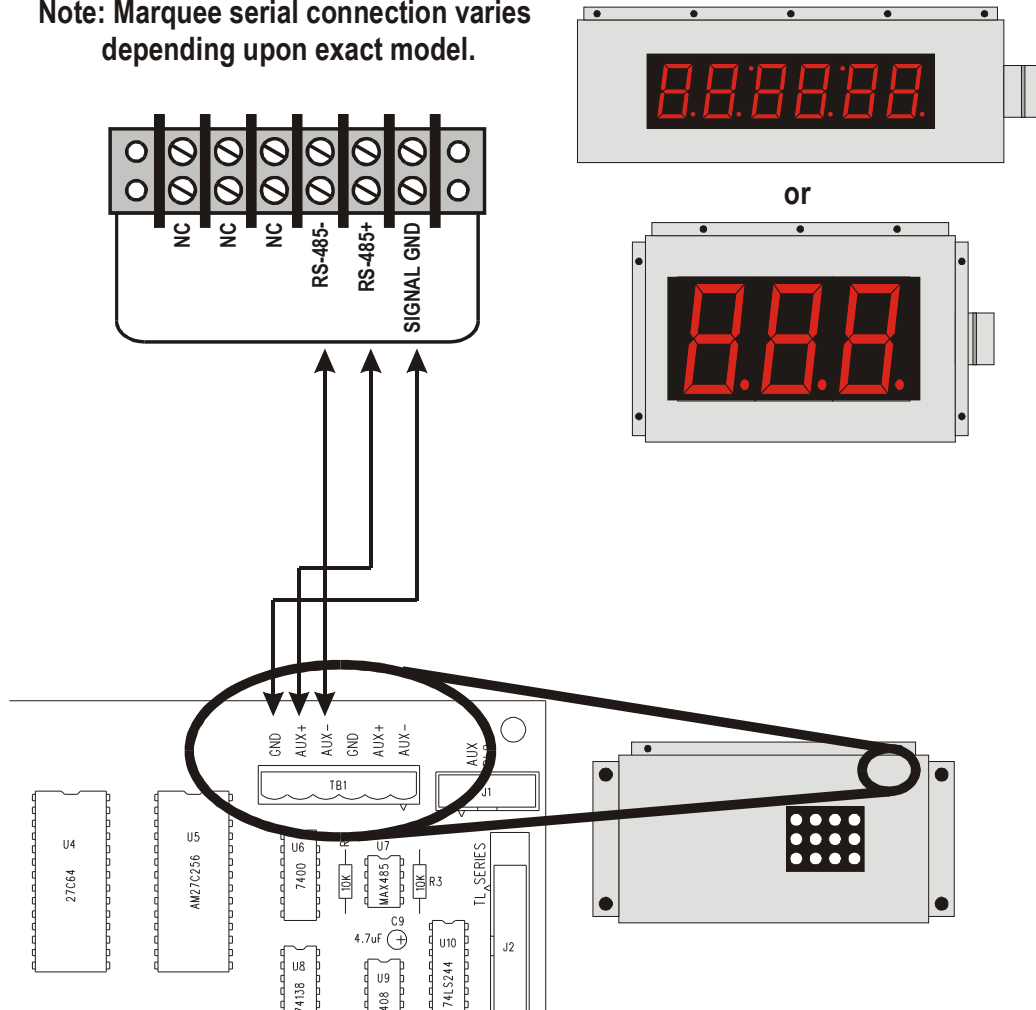




## 1.5 Installing Control Box to Marquee RS-485 Wiring

Screw terminals are provided within the display marquee and the system control box for RS-485 communications. The PPM control box sends commands to the display marquee over this cable at 1200 baud, no parity, eight data bits, one stop bit using ALI numeric command protocol. Interconnect the units as shown using a three conductor cable rated for data communications. ALI suggests using Belden 9463 "Blue-Hose" cable. When 9463 is used, the RS-485 cable may not exceed four thousand feet in length. Consult the display manual for detailed instructions on marquee side communications wiring.

**Note: Marquee serial connection varies depending upon exact model.**



## 1.6 Notes on RS-485 Multi-drop Wiring

Up to sixty three display marquees can be connected to one PPM control box via RS-485 multi-drop wiring as long as the cable does not exceed four thousand feet in length. All of the marquees must be either HH:MM:SS or MM.M, however it is permissible to mix different display heights. For example, it is permissible to use 8" numerics in the production area, and 2" numerics in the management offices, all running from one PPM control box.

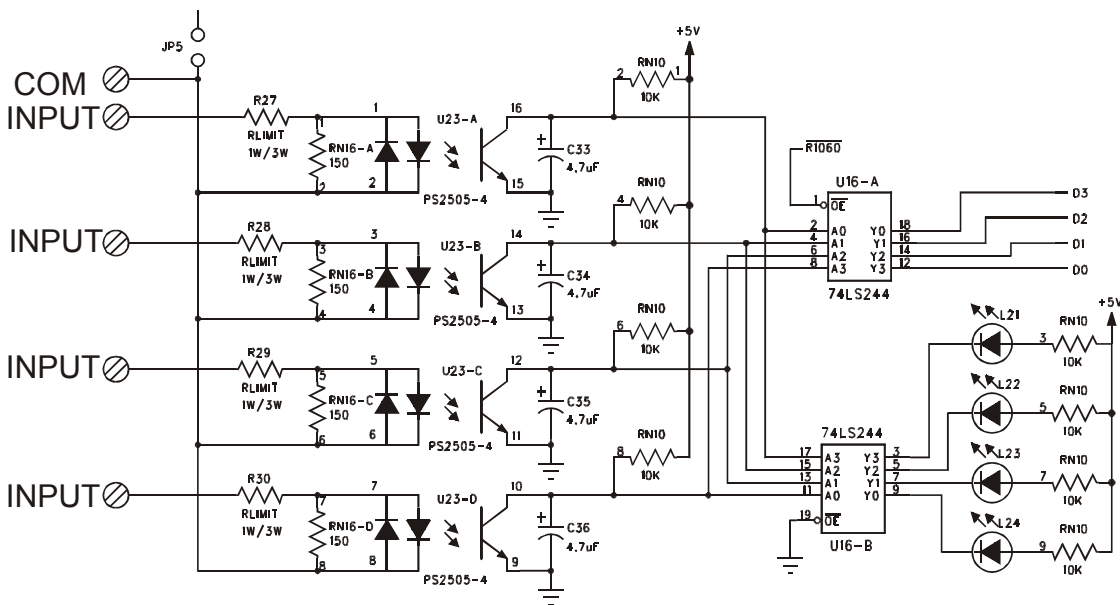
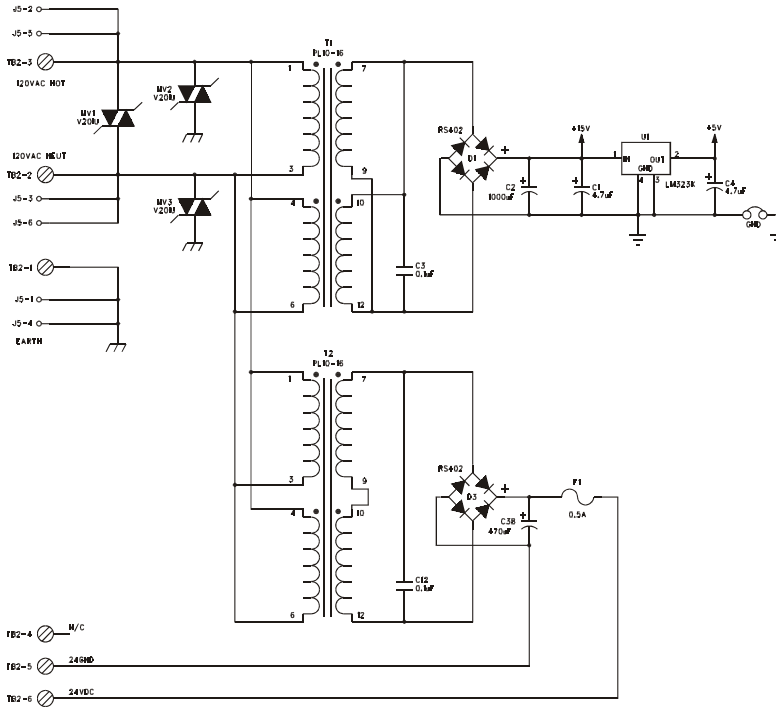
Connect all RS-485+ terminals in parallel, all RS-485- terminals in parallel, and all GROUND terminals in parallel.

# Production Pacing Metronome Owners Manual



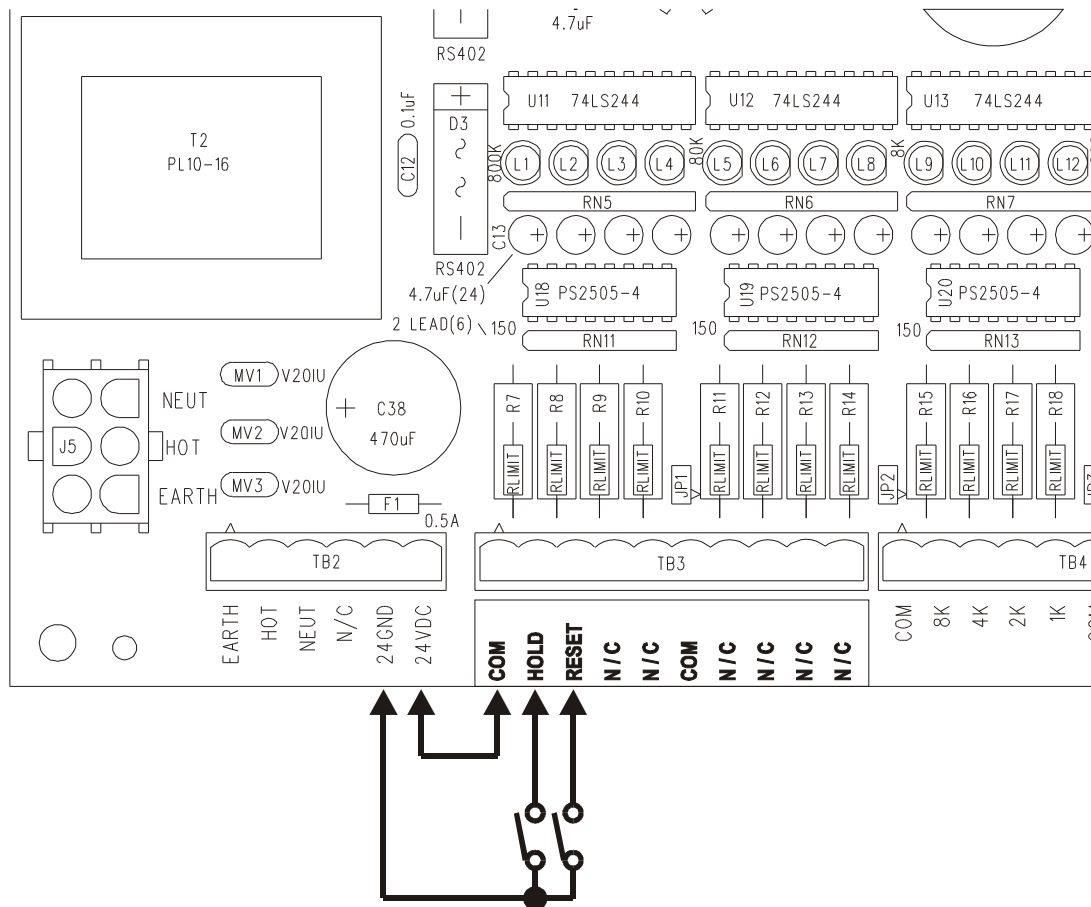
## 1.7 Logic Input Wiring

The PPM processor board has a 24VDC unregulated linear power supply to power the optically isolated logic inputs. The logic inputs are not sensitive to voltage polarity, only the presence or absence of about 30mA of current flowing through the input. Typically logic common is connected to 24VDC which configures the inputs to be activated by normally open relay contacts that connect the input terminals to 24VDC. With the logic common terminal connected to 24VDC, the inputs are compatible with most NPN transistor outputs as well. (2N3904 Typical)



Use of the logic inputs is not required. All PPM features are available from the operator keypad. However in some installations, it is convenient to make the PLC that runs the production line reset the PPM at the beginning of the shift, and hold the PPM during schedule breaks.

To assert any input, apply 24VDC between the common terminal and the desired input terminal. Typical customer wiring to the logic inputs is shown below.



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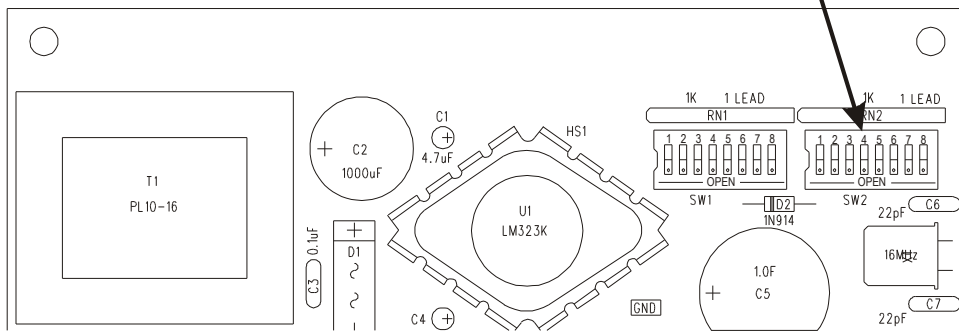


## 2.0 Configuration

The display marquee(s) must be configured for RS-485 communications at 1200 baud, with an address of '0' (30h). Typically, the marquee(s) will be purchased with the PPM control box, and American LED-gible will have properly configured the display marquees before shipment. For detailed instructions on configuring the marquee(s), see the manual(s) that comes with the marquee(s).

The PPM control box has three switch selectable features. Switches 4 through 6 on SW2 selects the display format. Switch 7 on SW2 enables the auto hold after reset feature. Switch 8 on SW2 enables the auto reset on zero feature.

Configure PPM miscellaneous options using SW2



## 2.1 Selecting the Display Format

The PPM processor board may be used with HH:MM:SS display marquees, HH:MM display marquees, MM:SS display formats, MMMM display marquees, SSSS display marquees, MMM display marquees, MM.M display marques, and SSS display marquees.

To configure the PPM Processor board for any one of the eight possible display formats, set SW2 switches 4, 5, and 6 as instructed in the following table.

SWITCH 4	SWITCH 5	SWITCH 6	Selected Display Format
OFF	OFF	OFF	HH:MM:SS (Six Digit Hours, Minutes, Seconds)
<b>ON</b>	OFF	OFF	HH:MM (Four Digit Hours, Minutes)
OFF	<b>ON</b>	OFF	MM:SS (Four Digit Minutes, Seconds)
<b>ON</b>	<b>ON</b>	OFF	MMMM (Four Digit Minutes)
OFF	OFF	<b>ON</b>	SSSS (Four Digit Seconds)
<b>ON</b>	OFF	<b>ON</b>	MMM (Three Digit Minutes)
OFF	<b>ON</b>	<b>ON</b>	MM.M (Three Digit Minutes, Tenths of Minutes)
<b>ON</b>	<b>ON</b>	<b>ON</b>	SSS (Three Digit Seconds)

## 2.2 Enabling Auto Hold after Reset

The PPM processor board may be configured to automatically HOLD the PPM after reset. When auto hold after reset is enabled, the system operator must press the RUN keypad button to start the PPM timing down after the system is reset.

To enable auto hold after reset, set switch 7 on SW2 to the ON position. To disable auto hold after reset, set switch 5 on SW2 to the OFF or OPEN position.

## 2.3 Enabling Auto Reset on Zero

The PPM processor board may be configured to automatically reset itself to the programmed Takt time when the PPM reaches zero. If auto reset is enabled, and auto hold is enabled, then when the PPM reaches zero, it will automatically reset itself to the programmed Takt time and then hold itself. If auto reset is enabled, and auto hold is disabled, then when the PPM reaches zero, it will automatically reset itself to the programmed Takt time and begin timing down again.

To enable auto reset on zero, set switch 8 on SW2 to the ON position. To disable auto reset on zero, set switch 6 on SW2 to the OFF or OPEN position.

## 3.0 Operation

When the PPM processor board powers up, it first restores Takt Time, 1<sup>st</sup> Warning, and 2<sup>nd</sup> Warning register values from backed up memory. If the PPM's backed up memory has expired then all PPM registers are reset to default values. The memory backup will retain register settings for one week without power.

Every PPM is operated at the factory for twenty four hours before shipping the unit to the customer. Therefore it is very likely that when the PPM starts up, the register settings used to test the PPM at the factory will be restored.

Apply power to both the display marquee and the PPM control box. When the display marquee powers up, it first performs power on self tests such as L.E.D. segment and / or digit lamp tests that vary depending upon exact model of display. For detailed information regarding the display power on self tests, see the display marquee manual.

The PPM processor board completes it's self tests in about 0.25 seconds, and then begins transmitting data to the display marquees about four times per second. The AUX indicator lamp on the PPM processor board should blink each time the PPM sends a command to the displays.

Once the display marquee completes it's power on self tests, it should display the data being sent from the PPM processor board. To confirm communications, press the [F1] key on the keypad once. This places the PPM system in adjust Takt Time mode. The display marquee will flash while the PPM is in any of the adjust modes. If no keypad keys are pressed for twenty seconds, the PPM will time out and abort the adjustment, or alternately pressing [F1] again will cancel adjust Takt Time mode and return the PPM back to normal operating mode.

Both the [TOP] and the [BOT] reset keys reset the PPM to the programmed Takt Time. The [HOLD] key pauses the PPM. The [RUN] key cancels a keypad hold request. The [F1], [F2], and [F3] keys select registers for adjustment. The [F4] key accepts the adjusted register value. While adjusting a register, the [+] keys are used to "dial" in the new register value.

### 3.1 Adjusting the Takt Time Register

The Takt Time register holds the total expected work time for each production cycle. The PPM times down from the entered Takt Time to zero.

To adjust the Takt Time register, press the [F1] key. The PPM will flash the current Takt Time value on the display marquee. Use the [+] keys to dial in the new Takt time value.

The right most [+] key on the keypad changes the right most flashing digit of the displayed takt time. Each [+] key to the left changes the next digit to the left in the displayed takt time. In the case of three digit display formats, the left most [+] key on the keypad is not used. Use the [+] keys to "dial in" the desired new takt time.

When the desired new Takt Time value is flashing on the display, press the [F4] key to enter the adjustment. To cancel adjusting the Takt Time register, press the [F1] key again or simply wait for the PPM to time out the adjustment.

## 3.2 Adjusting the 1<sup>st</sup> Warning Register

If a warning alarm is desired, then the 1<sup>st</sup> Warning register may be set to a non zero value. Setting the 1<sup>st</sup> Warning register to zero disables the warning. When the PPM reaches the 1<sup>st</sup> Warning Time, the audible alarm will sound for ½ second.

To adjust the 1<sup>st</sup> Warning register, press the [F2] key. The PPM will flash the current 1<sup>st</sup> Warning value on the display marquee. Use the [+] keys to dial in the new 1<sup>st</sup> Warning time value in the same way that Takt Time is entered.

When the desired new 1<sup>st</sup> Warning value is flashing on the display, press the [F4] key to enter the adjustment. To cancel adjusting the 1<sup>st</sup> Warning register, press the [F2] key again or simply wait for the PPM to time out the adjustment.

## 3.3 Adjusting the 2<sup>nd</sup> Warning Register

If a second warning alarm are desired, then the 2<sup>nd</sup> Warning register may be set to a non zero value. Setting the 2<sup>nd</sup> Warning register to zero disables the warning. When the PPM reaches the 2<sup>nd</sup> Warning Time, the audible alarm will sound for 1 second.

To adjust the 2<sup>nd</sup> Warning register, press the [F3] key. The PPM will flash the current 2<sup>nd</sup> Warning value on the display marquee. Use the [+] keys to dial in the new 2<sup>nd</sup> Warning time value in the same way that Takt Time is entered.

When the desired new 2<sup>nd</sup> Warning value is flashing on the display, press the [F4] key to enter the adjustment. To cancel adjusting the 2<sup>nd</sup> Warning register, press the [F3] key again or simply wait for the PPM to time out the adjustment.

## 3.4 PPM Operation Example

Widget Co. the worlds leading manufacturer of widgets, wishes to manufacture 12 widgets during each eight hour shift, and would like warning alarms when 15 and 5 minutes remain in the production cycle. Widget Co's production process runs continuously twenty four hours per day without any breaks.

Widget Co. decides to enable auto reset and disable auto hold so that the PPM system will run continuously unless the system operator presses the [HOLD] key.

480 minutes are worked during each eight hour shift ( $8 * 60 = 480$ ), and since each shift must complete 12 units, a unit must be completed every 40 minutes ( $480 / 12 = 40$ ). Thus Takt Time must be set to 40 minutes, the 1<sup>st</sup> Warning register must be set to 15 minutes, and the 2<sup>nd</sup> Warning register set to 5 minutes.

To enable auto reset on zero, set switch 8 on SW2 to the ON position. To disable auto hold on reset, set switch 7 on SW2 to the OFF position. The PPM is now configured to automatically cycle continuously.

To set the Takt time, press the [F1] key to select adjust Takt Time mode, and use the [+] keys to “dial” in a Takt time of 40 minutes. On a MM.M display, 40 minutes is entered as “40.0”. On a HH:MM:SS display, 40 minutes is entered as “00:40:00”. Press [F4] to enter the new Takt Time.

To set the 1<sup>st</sup> Warning time, press the [F2] key to select adjust 1<sup>st</sup> Warning Time mode, and use the [+] keys to “dial” in a 1<sup>st</sup> Warning Time of 15 minutes. On a MM.M display, 15 minutes is entered as “15.0”. On a HH:MM:SS display, 15 minutes is entered as “00:15:00”. Press [F4] to enter the new 1<sup>st</sup> Warning Time.

To set the 2<sup>nd</sup> Warning time, press the [F3] key to select adjust 2<sup>nd</sup> Warning Time mode, and use the [+] keys to “dial” in a 2<sup>nd</sup> Warning Time of 5 minutes. On a MM.M display, 5 minutes is entered as “05.0”. On a HH:MM:SS display, 5 minutes is entered as “00:05:00”. Press [F4] to enter the new 2<sup>nd</sup> Warning Time.

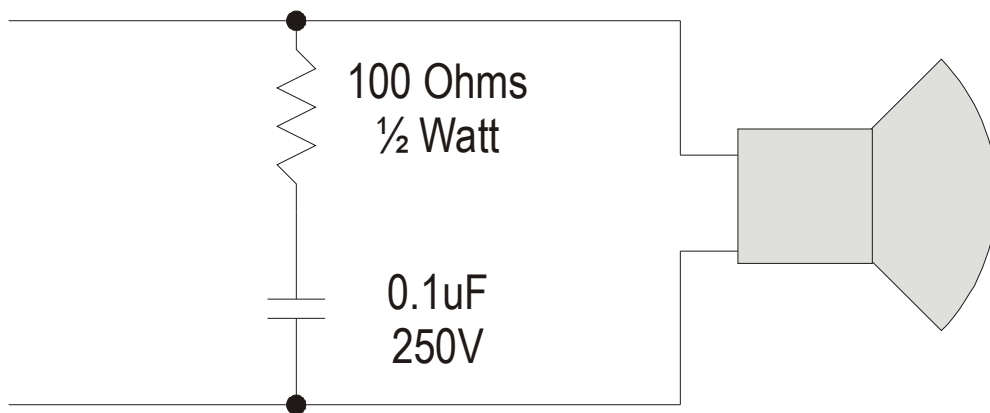
# Production Pacing Metronome Owners Manual



Finally press the [TOP] reset key to reset the PPM to the programmed Takt Time and if the PPM is held press the [RUN] key to start it running down. The PPM will time down from 40 minutes to zero over and over again, sounding audible alarms at 15 minutes, 5 minutes, and at the end of the production cycle.

## 3.5 Notes on Audible Alarms

The display marquees have a Federal Signal Model 350 Series B1 Virbratone Horn installed. To reduce electrical noise ALI installs a snubber filter in the Horn. If the Horn is ever replaced, it is important to install a snubber filter as shown in the diagram below.





## 4.0 In Case of Difficulties

Before contacting ALI for technical support, please review the manual sections covering installation and operation.

If the PPM processor does not seem to work, check the power indicator lamp in the bottom right corner of the processor board. This L.E.D. is connected directly to the processor power supply. If it does not light then the 120VAC power wiring is probably incorrect.

Next check the AUX indicator lamp. This lamp lights when the processor board is sending data to the display marquee. It should blink four times per second. If the AUX lamp is blinking as expected, the PPM processor is probably working properly, check the RS-485 wiring, and the configuration of the display marquee.

### 4.1 Contacting American LED-gible® Inc.

If you need technical assistance, contact us by phone or fax and please have the following information available:

- 1) Model number.
- 2) Serial number.
- 3) Description of the problem.

The serial number and model number of the PPM Control box can be located on the right side of the unit imprinted on a SILVER ID TAG.

American LED-gible Inc. (614) 851-1100 February 2003 Model # SO-6085-001 Serial # SO-6085-101
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American LED-gible® technical support may be reached at:

Phone: (614) 851-1100

Fax: (614) 851-1121

E-mail: [ledgible@ledgible.com](mailto:ledgible@ledgible.com)

WWW: [www.ledgible.com](http://www.ledgible.com)

# Production Pacing Metronome Owners Manual



## 5.0 PPM Control Box Specifications

### GENERAL:

Line Voltage	120VAC 60Hz
Power Consumption	Less than 20 Watts
Operating Temperature	0° F to 135° F (-17° C to +50° C)
Operating Humidity	35% to 80%
Dimensions	16" Wide by 9" tall by 5" deep
Weight	Less than 10 pounds
Enclosure	NEMA-12 painted steel standard
Mounting	Wall mount tabs

### Operation:

Function	Electronic Production Metronome
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### Communications:

Signaling	RS-485, Transmit Only
Baud Rate	1200 Baud, Hard Coded
Character Format	Eight Data Bits, No Parity, One Stop Bit

### Logic Inputs:

Quantity	8
Logic Level	24VDC
Maximum Input Current	30mA for 24VDC
Leakage Current Tolerance	5mA Maximum

## 6.0 Limited Warranty

We warrant to you that your AMERICAN LED-gible® BRAND MARQUEE, when purchased by you, will be free from defects in material and workmanship, under normal use, for one year from date of delivery. If your LED-GIBLE® BRAND MARQUEE should prove to be defective within the warranty period, we will repair it (or, if we think necessary, replace it) without charge to you.

To obtain service, please call our Customer Service Department at 1-614-851-1100 or write to:

AMERICAN LED-gible® Inc.  
1776 LONE EAGLE STREET  
COLUMBUS, OHIO 43228

We will furnish you with shipping instructions. This warranty covers merchandise returned to American LED-gible® (shipped prepaid) for repair, not in plant repairs. Should you need an in plant repair at your facility, American LED-gible® will schedule a trip. Rates are per diem, plus travel expenses.

ALI shall have the right of final determination as to the existence and cause of the defect. This warranty expressly excludes any defects or damages caused by accessories, replacement parts, or repair service, other than those which have been authorized by ALI. This warranty does not cover any damage caused by accident, misuse, shipment, or other than ordinary use.

This warranty excludes all incidental or consequential damages. Some states do not allow the exclusion of, or limitation of, incidental or consequential damages, so the foregoing exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. This warranty is in lieu of any other warranty, express, written, implied, or statutory, and no agreement extending or modifying it will be binding upon ALI, unless in writing and signed by duly authorized officer.

If your AMERICAN LED-gible® MARQUEE is outside the warranty period, please call our Customer Service Department as above. After you return the unit to American LED-gible®, we will estimate the repair charges, and contact you so a purchase order can be issued. Again, should you require in-house repair of your marquees, ALI rates are per diem, plus travel expenses. Please make sure to call, so a trip can be scheduled if this option is preferred.

### **LIMITATION OF LIABILITY:**

If this product is not in good working order as warranted above, your sole remedy shall be repair or replacement as provided above. In no event will ALI be liable for special, indirect, or consequential damages, or any damages whatsoever resulting from loss of use, data, or profits arising out of, or in connection with this contract or the use or performance of ALI products, whether in an action of contract or tort, including negligence. ALI's liability for damage to property shall be limited to the cost of the product sold to the buyer.

# Production Pacing Metronome Owners Manual



## 7.0 ASCII Chart

ASCII CHARACTER	Hexadecimal Code	Decimal Code
CTRL-A	01h	1
CTRL-B	02h	2
CTRL-C	03h	3
CTRL-D	04h	4
CTRL-E	05h	5
CTRL-F	06h	6
CTRL-G	07h	7
CTRL-H	08h	8
CTRL-I	09h	9
CTRL-J	0Ah	10
CTRL-K	0Bh	11
CTRL-L	0Ch	12
CTRL-M	0Dh	13
CTRL-N	0Eh	14
CTRL-O	0Fh	15
CTRL-P	10h	16
CTRL-Q	11h	17
CTRL-R	12h	18
CTRL-S	13h	19
CTRL-T	14h	20
CTRL-U	15h	21
CTRL-V	16h	22
CTRL-W	17h	23
CTRL-X	18h	24
CTRL-Y	19h	25
CTRL-Z	1Ah	26
CTRL-[	1Bh	27
CTRL-\	1Ch	28
CTRL-]	1Dh	29
CTRL-^	1Eh	30
CTRL-_ SPACE	1Fh 20h	31 32

ASCII CHARACTER	Hexadecimal Code	Decimal Code
!	21h	33
"	22h	34
#	23h	35
\$	24h	36
%	25h	37
&	26h	38
'	27h	39
(	28h	40
)	29h	41
*	2Ah	42
+	2Bh	43
,	2Ch	44
-	2Dh	45
.	2Eh	46
/	2Fh	47
0	30h	48
1	31h	49
2	32h	50
3	33h	51
4	34h	52
5	35h	53
6	36h	54
7	37h	55
8	38h	56
9	39h	57
:	3Ah	58
;	3Bh	59
<	3Ch	60
=	3Dh	61
>	3Eh	62
?	3Fh	63
@	40h	64

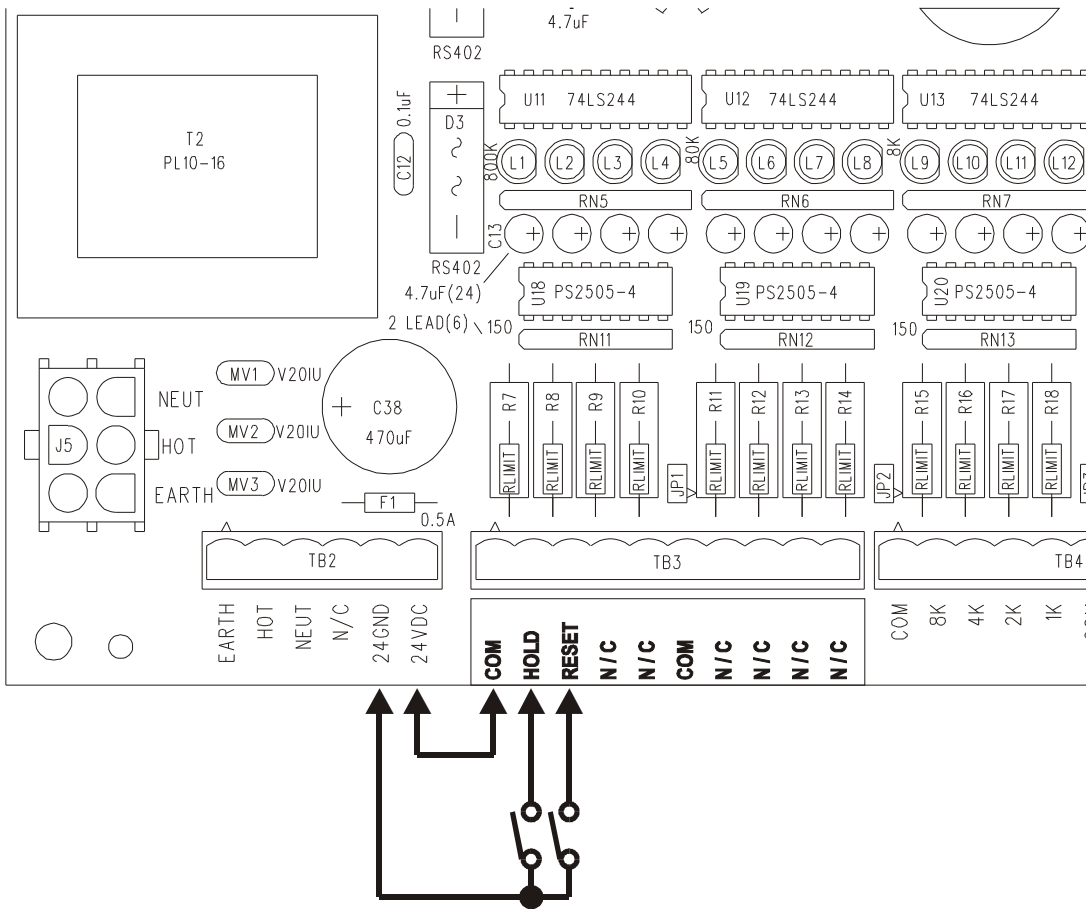
ASCII CHARACTER	Hexadecimal Code	Decimal Code
A	41h	65
B	42h	66
C	43h	67
D	44h	68
E	45h	69
F	46h	70
G	47h	71
H	48h	72
I	49h	73
J	4Ah	74
K	4Bh	75
L	4Ch	76
M	4Dh	77
N	4Eh	78
O	4Fh	79
P	50h	80
Q	51h	81
R	52h	82
S	53h	83
T	54h	84
U	55h	85
V	56h	86
W	57h	87
X	58h	88
Y	59h	89
Z	5Ah	90
[	5Bh	91
\	5Ch	92
]	5Dh	93
^	5Eh	94
_	5Fh	95
'	60h	96

ASCII CHARACTER	Hexadecimal Code	Decimal Code
a	61h	97
b	62h	98
c	63h	99
d	64h	100
e	65h	101
f	66h	102
g	67h	103
h	68h	104
i	69h	105
j	6Ah	106
k	6Bh	107
l	6Ch	108
m	6Dh	109
n	6Eh	110
o	6Fh	111
p	70h	112
q	71h	113
r	72h	114
s	73h	115
t	74h	116
u	75h	117
v	76h	118
w	77h	119
x	78h	120
y	79h	121
z	7Ah	122
{	7Bh	123
	7Ch	124
}	7Dh	125
~	7Eh	126
DELETE	7Fh	127

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## 8.0 Connection Labels



COM	HOLD	RESET	N/C	N/C	COM	N/C	N/C	N/C	N/C	COM	HOLD	RESET	N/C	N/C	COM	N/C	N/C	N/C	N/C
COM	HOLD	RESET	N/C	N/C	COM	N/C	N/C	N/C	N/C	COM	HOLD	RESET	N/C	N/C	COM	N/C	N/C	N/C	N/C