Innovative operator interface, measurement, monitoring and control solutions
The Trusted Source for Innovative Control Solutions

1-717-767-6511
# QUICK Specs

## Rate Meters

<table>
<thead>
<tr>
<th>Description</th>
<th>DT8</th>
<th>PAXLR</th>
<th>PAXLPT</th>
<th>CUB5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indication</strong></td>
<td>Rate Indicator</td>
<td>1/8 DIN Rate Indicator</td>
<td>1/8 DIN Process Time Indicator</td>
<td>Counter/Rate Meter with Output Option Card Capability</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>39 mm (H) x 75mm (W)</td>
<td>50 mm (H) x 97mm (W)</td>
<td>50 mm (H) x 97mm (W)</td>
<td>39 mm (H) x 75mm (W)</td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td>5 Digit, .6° (15mm) Reflective, Green and Red Backlight LCD</td>
<td>6 Digit, .56° (14mm) LED</td>
<td>Decimal and Chronometer Modes</td>
<td>6 Digit, .46° (12mm) Reflective, Green and Red Backlight LCD</td>
</tr>
<tr>
<td><strong>Measurement Format</strong></td>
<td>Selectable Time Base Range 4 msec to 32 sec.</td>
<td>Adjustable Time Interval</td>
<td>Adjustable Time Interval</td>
<td>Adjustable Time Interval</td>
</tr>
<tr>
<td><strong>Max. Input Frequency</strong></td>
<td>10,000 Counts/Sec.</td>
<td>25,000 Counts/Sec.</td>
<td>25,000 Counts/Sec.</td>
<td>20,000 Counts/Sec.</td>
</tr>
<tr>
<td><strong>Decimal Points</strong></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Sensor Power</strong></td>
<td>No, with Micro Line Power Supply</td>
<td>9 to 17.5 VDC @ 100 mA</td>
<td>9 to 17.5 VDC @ 100 mA</td>
<td>No, with Micro Line Power Supply</td>
</tr>
<tr>
<td><strong>Setpoint Capability</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Single Form C Relay Dual Sinking</td>
</tr>
<tr>
<td><strong>Communications</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>RS485</td>
</tr>
<tr>
<td><strong>Power Source</strong></td>
<td>3 Volt Lithium Battery, Backlighting 9 - 28 VDC @ 35 mA</td>
<td>115/230 VAC 10 to 16 VDC</td>
<td>115/230 VAC 10 to 16 VDC</td>
<td>9 to 28 VDC</td>
</tr>
<tr>
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</table>

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## QUICK Specs

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<tr>
<th>Rate Meters</th>
<th>CONTROL</th>
<th>INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PAXLCR</strong></td>
<td>1/8 DIN Counter/Rate Meter with Setpoint Capability</td>
<td>Dual Rate Meter with Math Functions</td>
</tr>
<tr>
<td><strong>PAXR</strong></td>
<td>1/8 DIN Rate Meter with Setpoint Card Capability</td>
<td></td>
</tr>
<tr>
<td><strong>PAXI</strong></td>
<td>1/8 DIN Counter/Rate Meter with Output Option Card Capability</td>
<td></td>
</tr>
<tr>
<td><strong>GEM52</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Description
- **Dimensions (Height)x(Width)**
  - PAXLCR: 50 mm (H) x 97mm (W)
  - PAXR: 50 mm (H) x 97mm (W)
  - PAXI: 50 mm (H) x 97mm (W)
  - GEM52: 69 mm (H) x 133 mm (W)

- **Display**
  - PAXLCR: 6 Digit, .56" (14mm) Standard
  - PAXR: 5 Digit, .56" (14mm) Standard Green or Sunlight Readable Red LED, Adjustable Intensity
  - PAXI: 6 Digit, .56" (14mm) Standard Green or Sunlight Readable Red LED, Adjustable Intensity
  - GEM52: 6 Digit, .56" (14mm) LED

- **Measurement Format**
  - PAXLCR: Uni-Directional
  - PAXR: Adjustable Time Interval
  - PAXI: Adjustable Time Interval
  - GEM52: Adjustable Time Interval, Ratio (A/B), Difference (A-B), Draw [(A-B)/B] or Dual Rate

- **Max. Input Frequency**
  - PAXLCR: 20,000 Counts/Sec. Program Dependent
  - PAXR: 34,000 Counts/Sec.
  - PAXI: 34,000 Counts/Sec.
  - GEM52: 10,000 Counts/Sec.

- **Decimal Points**
  - Yes

- **Sensor Power**
  - PAXLCR: 24 VDC @ 100 mA, over 50 V
  - PAXR: 12 VDC @ 100 mA
  - PAXI: 12 VDC @ 100 mA
  - GEM52: 12 VDC @ 100 mA

- **Setpoint Capability**
  - PAXLCR: Dual Form C Relays
  - PAXR: Dual Form C
  - PAXI: Dual Form C
  - GEM52: Single or Dual Form C

- **Communications**
  - PAXLCR: No
  - PAXR: No
  - PAXI: No
  - GEM52: RS232, RS485, Modbus, DeviceNet, Profibus, Ethernet w/ICM8

- **Power Source**
  - PAXLCR: 50 to 250 VAC
  - PAXR: 85 to 250 VAC
  - PAXI: 85 to 250 VAC
  - GEM52: 115/230 VAC

### Additional Information
- *See website for product information.*

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## Rate Meters

<table>
<thead>
<tr>
<th>Description</th>
<th>MDC</th>
<th>HHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Drive Controller</td>
<td>Hand Held Rate Indicator</td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>75 mm (H) x 75 mm (W)</td>
<td>170 mm (H) x 72 mm (W)</td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td>2 x 8 Digit, .3&quot; (7mm) Red Backlight LCD</td>
<td>5 Digit, .4&quot; (10mm) LCD</td>
</tr>
</tbody>
</table>
| **Measurement Format** | Master & Follower Modes  
Loop Response:  
10 msec (Master)  
20 msec (Follower) | Touch Type [HHT]  
Revs./Min  
Feet/Min  
Meters/Min  
Photo Type [HHTP]  
Revs/Min |
| **Max. Input Frequency** | 20,000 Counts/Sec. | 1999 RPM, 1999.9 M/Min  
6560 Ft/Min [HHT]  
100,000 RPM [HHTP] |
| **Decimal Points**  | Yes        | Yes        |
| **Sensor Power**    | 12 VDC @ 100 mA | No |
| **Setpoint Capability** | 3 Current Sinking  
0 to 15 VDC | No |
| **Communications**  | No         | No         |
| **Power Source**    | 115/230 VAC | 4 x 1.5 V AA size |
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## WHAT YOU’RE USING NOW vs CURRENT PRODUCT

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>FEATURES</th>
<th>MODEL NUMBER</th>
<th>FEATURES</th>
</tr>
</thead>
</table>
| **DT5**      | • Display: 4 Digit, .35” (9 mm) Reflective LCD  
               • Power Source: 2 “N” Alkaline Batteries  
               • Measurement Format: Fixed One Second | DT8 | • Display: 5 Digit, .6” (15 mm) Reflective and Backlight LCD  
               • Power Source: Internal Battery  
               • Measurement Format: Time Base |
| **DT6**      | • Display: 4 Digit, .35” (9 mm) Reflective LCD  
               • Power Source: 2 “N” Alkaline Batteries or 5 to 24 VDC  
               • Measurement Format: Time Base | DT8 | • Display: 5 Digit, .6” (15 mm) Reflective and Backlight LCD  
               • Power Source: Internal Battery  
               • Measurement Format: Time Base |
| **DT7**      | • Display: 4 Digit, .6” (15 mm) Reflective and Backlight LCD  
               • Power Source: Internal Battery  
               • Measurement Format: Time Base | DT8 | • Display: 5 Digit, .6” (15 mm) Reflective and Backlight LCD  
               • Power Source: Internal Battery  
               • Measurement Format: Time Base |
| **DT8**      | • Display: 5 Digit, .35” (9 mm) Reflective LCD  
               • Power Source: Internal Battery  
               • Measurement Format: Time Base | **DT8** | • Display: 5 Digit, .6” (15 mm) Reflective and Backlight LCD  
               • Power Source: Internal Battery  
               • Measurement Format: Time Base |
| **DT9**      | • Display: 4 Digit, .46” (12 mm) Reflective and Backlight LCD  
               • Power Source: Internal Battery  
               • Measurement Format: Time Base | **DT8** | • Display: 5 Digit, .6” (15 mm) Reflective and Backlight LCD  
               • Power Source: Internal Battery  
               • Measurement Format: Time Base |
| **DT3A**     | • Display: 4 Digit, .43” (11 mm) Red LED  
               • Power Source: 115/230 VAC, 12 VDC  
               • Measurement Format: Time Base | **PAXLR** | • Display: 6 Digit, .56” (14 mm) Red LED  
               • Power Source: 115/230 VAC, 10 to 16 VDC  
               • Measurement Format: Programmable Scaling and Update  
               • Requires Appropriate Option Card |
| **DT3D**     | • Display: 4 Digit, .43” (11 mm) Red LED  
               • Power Source: 115/230 VAC, 12 VDC  
               • Measurement Format: Time Base | **PAXLR** | • Display: 6 Digit, .56” (14 mm) Red LED  
               • Power Source: 115/230 VAC, 10 to 16 VDC  
               • Measurement Format: Programmable Scaling and Update  
               • Requires Appropriate Option Card |
| **APLR & APLRI** | • Display: 4 or 5 Digit, .56” (14 mm) Red LED  
               • Construction: Metal Front Bezel  
               • Power Source: 115/230 VAC, 11 to 14 VDC  
               • Measurement Format: Time Base | **PAXLR** | • Display: 6 Digit, .56” (14 mm) Red LED  
               • Power Source: 115/230 VAC, 10 to 16 VDC  
               • Measurement Format: Programmable Scaling and Update  
               • Requires Appropriate Option Card |
| **APLPT**    | • Display: 4 or 5 Digit, .56” (14 mm) Red LED  
               • Power Source: 115/230 VAC, 11 to 14 VDC  
               • Measurement Format: Process Time | **PAXLR** | • Display: 6 Digit, .56” (14 mm) Red LED  
               • Power Source: 115/230 VAC, 10 to 16 VDC  
               • Measurement Format: Programmable Scaling and Update  
               • Requires Appropriate Option Card |
| **IMI**      | • Display: 6 Digit, .56” (14 mm) Red LED  
               • Power Source: 115/230 VAC  
               • Count Speed: 50 KHz Max. | **PAXI** | • Display: 6 Digit, .56” (14 mm) Red LED  
               • Power Source: 115/230 VAC, 11 to 36 VDC  
               • Count Speed: 34 KHz Max.  
               • Requires Appropriate Option Card |

Note: Refer to the current product literature, as some differences may exist.
DITAK 8 - ADJUSTABLE TIMEBASE 5-DIGIT RATE INDICATOR

- LCD, POSITIVE REFLECTIVE OR NEGATIVE TRANSMISSIVE WITH YELLOW/GREEN OR RED BACKLITING
- 0.6 INCH (15.2 mm) HIGH DIGITS
- ADJUSTABLE TIMEBASE FROM 4 MSEC TO 32 SEC
- INTERNAL LITHIUM BATTERY PROVIDES OVER 7 YEARS OF CONTINUOUS OPERATION
- NEMA 4X/IP65 SEALED FRONT PANEL BEZEL
- ACCEPTS MANGNETIC OR LOGIC TYPE SIGNAL INPUTS
- WIRE CONNECTIONS MADE VIA SCREW CLAMP TYPE TERMINALS

DESCRIPTION

The Ditak 8 is a self-powered rate indicator which features selectable Timebase Increments by setting the appropriate DIP switches on the rear of the unit. The internal 3.0 VDC lithium battery will operate continuously for at least 7 years. It has a 5-digit LCD display with 0.6 inch (15.2 mm) high digits. 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. Backlight version units require power from an external 9 to 28 VDC supply.

The unit is constructed of a lightweight, high impact plastic case with a clear viewing window. The sealed front panel meets NEMA 4X/IP65 specifications for wash-down and/or dusty environments, when properly installed.

The optional Micro Line/Sensor Power Supply (MLPS1000) is designed to attach to the rear of an installed Ditak 8. The optional supply can be powered from 85 to 250 V AC, and can provide power for the backlighting of a unit and most sensors.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

SPECIFICATIONS

1. DISPLAY: 5-Digit LCD, 0.6" (15.2 mm) high digits.
2. POWER SOURCE: Internal 3.0 V lithium battery provides over 7 years of continuous service (battery life is dependent upon usage).
3. BACKLIGHT POWER REQUIREMENTS: 9 to 28 VDC @ 35 mA. Above 26 VDC, derate operating temperature to 50°C. Must use the MLPS1 or a Class 2 or SELV rated power supply.
4. SIGNAL INPUT: 0 to 10 KHz from a magnetic or bi-polar output (with a 50% duty cycle). Min. input sensitivity is 0.9 V. Max. input = 28 VDC.
5. TIMEBASE: Adjustable in 1/256 sec (3.906 msec) increments via DIP switches located at the rear of the unit. Timebase ranges from 3.906 msec to 31.998 sec; 0.01% ±1 digit accuracy.
6. ENVIRONMENTAL CONDITIONS:
   Operating Temperature: 0 to 60°C (Above 50°C derate backlight operating voltage to 26 VDC max.)
   Storage Temperature: -40 to 80°C
   Operating and Storage Humidity: 85% max. (non-condensing) from 0°C to 60°C.
   Altitude: Up to 2000 meters
7. CONSTRUCTION: High impact plastic case with clear viewing window (Panel gasket and mounting clip included), Installation Category I, Pollution Degree 2.

ORDERING INFORMATION

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<thead>
<tr>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT8</td>
<td>Adjustable Timebase Tachometer</td>
<td>DT800000</td>
</tr>
<tr>
<td>DT800010</td>
<td>Adjustable Timebase Tachometer with Yellow/Green Backlighting</td>
<td>DT800010</td>
</tr>
<tr>
<td>DT800020</td>
<td>Adjustable Timebase Tachometer with Red Backlighting</td>
<td>DT800020</td>
</tr>
<tr>
<td>MLPS1000</td>
<td>Micro Line Sensor/Power Supply</td>
<td>MLPS1000</td>
</tr>
</tbody>
</table>

For more information on Pricing, Enclosures & Panel Mount Kits refer to the RLC Catalog or contact your local RLC distributor.

DIMENSIONS In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.15" (54.6) H x 3.00" (76.2) W.
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. In extremely high EMI environments, additional measures may be needed. 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. 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.

2. 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.

3. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.

4. 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 #28B2029-0A

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

   Note: Refer to manufacturer’s instructions when installing a line filter.

5. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.

WIRING CONNECTIONS

The electrical connections are made via rear screw-clamp terminals located on the back of the unit. All conductors should meet voltage and current ratings for each terminal. Also cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the unit (AC or DC) be protected by a fuse or circuit breaker. When wiring the unit, use the label to identify the wire position with the proper function. Strip the wire, leaving approximately 1/4” bare wire exposed (stranded wires should be tinned with solder). Insert the wire into the screw-clamp terminal and tighten the screw until the wire is clamped tightly. Each terminal can accept up to two #14 AWG wires.

The backlighting for a backlight version unit is powered between Terminal 2 (V+) and Terminal 1 (GND).

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**Variable Frequency AC Inputs, Signal Source Powered**

Minimum V_{AC} for operation is 0.9 V peak.

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**Logic Pulse Inputs From Other Circuits & Sensors**

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**Specifications (Cont’d)**

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 4X Enclosure rating (Face only), UL50

   **ELECTROMAGNETIC COMPATIBILITY**

   Emissions and Immunity to EN 61326

   **Immunity:**

   - Electrostatic discharge: EN 61000-4-2 Criterion B
   - Electromagnetic RF fields: EN 61000-4-3 Criterion A
   - Fast transients (burst): EN 61000-4-4 Criterion B
   - Surge: EN 61000-4-5 Criterion A
   - RF conducted interference: EN 61000-4-6 Criterion A
   - Voltage dip/interruptions: EN 61000-4-11 Criterion A

   **Emissions:**

   - EN 55011 Class B

   **Notes:**

   2. Criterion B: Temporary loss of performance from which the unit self-recovery.

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

9. **WEIGHT:** 3.4 oz (96.4 g)
**REAR PANEL DIP SWITCHES**

When viewing the Ditak 8 from the rear, there are two banks of DIP switches located along the top edge of the PC board. The bank of eight switches to the left is labeled SWA and the bank of six switches to the right is labeled SWB. All of the SWA switches and five of the SWB switches are used to select the desired Timebase. The remaining switch of SWB is used to select Frequency Doubling.

**WARNING:** Lithium battery may explode if incinerated.

**FREQUENCY DOUBLING**

DIP switch SWB 6 is the “Frequency Doubling” switch. When it is in the “ON” position, frequency doubling is disabled. When set to the “OFF” position, it is enabled and twice the number of input pulses are registered in the unit. This doubling of the input rate allows the Timebase Increment Total to be halved, thus allowing a faster update time for a given display value.

**TIMEBASE SELECTION**

The Ditak 8 has a Timebase selection range from 3.906 msec to 31.998 sec. SWA 1 is set to the “ON” position for the minimum Timebase setting. SWA 1 through SWB 5 are set to the “ON” position for the maximum Timebase setting. A specific Timebase setting is achieved by adding the appropriate individual Timebase increments.

### TIMEBASE INCREMENT TOTAL (TBIT)

\[
\text{TBIT} = \frac{\text{DR} \times 15.361}{\text{RPM} \times \text{PPR} \times \text{FQ.DBL.}}
\]

**WHERE:**

- **DR** = Desired Reading
- **RPM** = Revolutions Per Minute
- **PPR** = Pulses Per Revolution
- **FQ.DBL.** = Frequency Doubling disabled (times 1 switch on, times 2 switch off)

**Example:** Find the appropriate Timebase DIP switch setting for desired parameters.

<table>
<thead>
<tr>
<th>Timebase Increment</th>
<th>Timebase</th>
<th>Switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWA 1 1</td>
<td>SWB 1 256</td>
<td></td>
</tr>
<tr>
<td>SWA 2 2</td>
<td>SWB 2 512</td>
<td></td>
</tr>
<tr>
<td>SWA 3 4</td>
<td>SWB 3 1024</td>
<td></td>
</tr>
<tr>
<td>SWA 4 8</td>
<td>SWB 4 2048</td>
<td></td>
</tr>
<tr>
<td>SWA 5 16</td>
<td>SWB 5 4096</td>
<td></td>
</tr>
<tr>
<td>SWA 6 32</td>
<td>SWB 6 FREQ. DBL.</td>
<td></td>
</tr>
<tr>
<td>SWA 7 64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWA 8 128</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With these DIP switch settings, the Timebase would be approximately 5.99 sec (1536 x 0.003906 = 5.995). To reduce the display update time, the “Frequency Doubling” switch can be enabled (set to the “OFF” position). Therefore, only half the Timebase will be necessary (768 x 0.003906 = 2.99 sec.).

**TYPICAL APPLICATION**

**CONVEYOR BELT SPEED INDICATOR**

It is desired to display the rate of a conveyor belt used to carry PC Boards through an infrared soldering chamber that is variable from 0 to 10 feet per minute. The rate must be adjusted depending on the size of the boards being soldered. The display of the rate indicator must read in feet per minute. The shaft of the variable speed motor contains a keyway. A speed of 100 RPM will produce a belt speed of 10 ft/min. A proximity sensor is used to monitor the speed of the shaft. The Ditak 8 can be used to display the belt speed in this application. The output signal of the sensor is connected to the Ditak 8 Terminal 3 (INP). The sensor common and shield are connected to the Ditak 8 Terminal 1 (GND). The Timebase setting is to be determined by using the formula.

**TIMEBASE INCREMENT TOTAL (TBIT)**

\[
\text{TBIT} = \frac{\text{DR} \times 15.361}{\text{RPM} \times \text{PPR} \times \text{FQ.DBL.}}
\]

**Example:**

Desired Readout (DR) = 2500
Revolutions Per Minute (RPM) = 1250
Pulses Per Revolution (PPR) = 50
FQ.DBL. = ON (times 1 switch on) / OFF (times 2 switch off)

\[
\text{TBIT} = \frac{2500 \times 15.361}{1250 \times 50 \times 1} = 614.44
\]

**TIMEBASE INCREMENT TOTAL (TBIT)**

**Example:** Find the appropriate Timebase DIP switch setting for desired parameters.

<table>
<thead>
<tr>
<th>Timebase Increment</th>
<th>Timebase</th>
<th>Switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWB 2 512</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWB 3 1024</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWB 4 2048</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWB 5 4096</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWB 6 FREQ. DBL.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With these DIP switch settings, the Timebase would be approximately 5.99 sec (1536 x 0.003906 = 5.995). To reduce the display update time, the “Frequency Doubling” switch can be enabled (set to the “OFF” position). Therefore, only half the Timebase will be necessary (768 x 0.003906 = 2.99 sec.).

**Note:** If no timebase switches are turned on, the Ditak 8 will default to 3.906 msec timebase.

**DIP switches SWA 2, 3, 6, 7, and SWB 2 are all set to the “ON” position for a Timebase Increment Total of 614. If it is desired to know what the approximate Timebase is in seconds, use the following formula:**

\[
\text{TBIT} \times 0.003906 = \text{Time in seconds}
\]

614 x 0.003906 = 2.398 sec.

With these DIP switch settings, the Timebase would be approximately 5.99 sec (1536 x 0.003906 = 5.995). To reduce the display update time, the “Frequency Doubling” switch can be enabled (set to the “OFF” position). Therefore, only half the Timebase will be necessary (768 x 0.003906 = 2.99 sec.).
INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents.

Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

INSTALLATION

The Ditak 8 meets NEMA 4X/IP65 requirements for indoor use, when properly installed. The units are intended to be mounted into an enclosed panel. A sponge rubber gasket, mounting clip, two screws, and nut fasteners are provided to install and seal the unit in the panel cut-out.

The following procedure assures proper installation:

1. Cut panel opening to specified dimensions. Remove burrs and clean panel opening.
2. Slide the panel gasket over the rear of the unit to the back of the bezel.
3. Slide nut fastener into slot on mounting clip and then insert mounting screw through nut on both sides of mounting clip. Tip of mounting screw should NOT project through hole on clip.
4. Install Ditak unit through panel cut-out.
5. Slide mounting clip over rear of unit until clip is against back of the panel. The mounting clip and Ditak housing have a latching feature to hold the unit in place until tightened.

Note: Hold the Ditak front bezel in place when sliding the mounting clip into position.

6. Alternately tighten each mounting screw to ensure uniform gasket pressure. Visually inspect the gasket for proper seal. The gasket should be compressed approximately 75 to 80% of its original thickness.
7. If the gasket is not adequately compressed and the mounting screws cannot be tightened any further, loosen mounting screws and insure that the clip is latched as close as possible to the panel.
8. Repeat step #6 for tightening the mounting screws.

TROUBLESHOOTING

For further technical assistance, contact technical support at the appropriate company numbers listed.
MODEL CUB5 - MINIATURE ELECTRONIC 8-DIGIT DUAL COUNTER AND RATE INDICATOR

This is a brief overview of the CUB5. For complete specifications and programming information, see the CUB5 Bulletin starting on page 102.

- LCD, REFLECTIVE OR GREEN/RED LED BACKLIGHTING
- 0.46" (11.7 mm) HIGH DIGITS
- OPTIONAL RELAY OUTPUT MODULE
- OPTIONAL COMMS OUTPUT MODULES
- COUNT SPEEDS UP TO 20 KHZ
- OPERATES FROM 9 TO 28 VDC POWER SOURCE
- PROGRAMMABLE SCALING FOR COUNT AND RATE
- BI-DIRECTIONAL COUNTING, UP/DOWN CONTROL
- QUADRATURE SENSING (UP TO 4 TIMES RESOLUTION)
- ANTI-COINCIDENCE COUNTING (ADD/ADD & ADD/SUB)
- NEMA 4X/IP65 SEALED FRONT BEZEL

SPECIFICATIONS

COUNTER DISPLAYS:
- Counter A: 8-digits, enabled in all count modes
  Display Range: -9999999 to 99999999
  Overflow Indication: Display flashes “Cnt OVEr”
- Counter B: 7-digits, enabled in Dual Counter mode only
  Display Designator: “b” to the left side of the display
  Display Range: 0 to 9999999 (positive count only)
  Overflow Indication: Display flashes “bCntOVEr”
- Maximum Count Rates: 50% duty cycle
  Without setpoint option card: 20 KHz (all count modes)
  With setpoint option card: 20 KHz for any count mode except Quadrature
  x4 (18 KHz) and Dual Counter (17 KHz)

RATE DISPLAY: 6-digits, may be enabled or disabled in any mode
- Display Designator: “R” to the left side of the display
- Display Range: 0 to 999999
- Over Range Display: “R OLOLOL”
- Maximum Frequency: 20 KHz
- Minimum Frequency: 0.01 Hz
- Accuracy: ±0.01%

COUNT/RATE SIGNAL INPUTS (INP A and INP B):
- Input A: DIP switch selectable to accept pulses from a variety of sources.
  See Section 2.0 Setting the DIP Switches for Input A specifications.
- Input B: Logic signals only
  Trigger levels: $V_{IL} = 1.0$ V max; $V_{IH} = 2.4$ V min; $V_{MAX} = 28$ VDC
  Current sinking: Internal 10KΩ pull-up resistor to +9 to 28 VDC
  Filter (LO Freq.): Damping capacitor provided for switch contact bounce.
  Limits input frequency to 50 Hz and input pulse widths to 10 msec min.
GENERAL DESCRIPTION

The PAX® Lite Rate Meter, Model PAXLR, provides the versatility and flexibility needed to accommodate virtually any rate measuring application. The meter has the ability to scale for direct readout in terms of the units being measured. Whether a machine produces bottles, cloth, wire, or beverage mix, operation is enhanced when the rate readout is expressed directly in bottles/min., feet/min., gallons/min., or whatever units are needed in plant applications.

The PAXLR can accommodate magnetic pickups, logic sensors, and NPN open collector sensors. The pulses are received and scaled, so the desired display can be achieved. The meter is programmed through both the front panel buttons and DIP switches. Once the programming is complete, the front panel buttons can be disabled by a DIP switch setting.

The meter has been specifically designed for harsh industrial environments. With NEMA 4X/IP65 sealed bezel and extensive testing to meet CE requirements, the meter provides a tough, yet reliable application solution.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CAUTION: Risk of Danger.
Read complete instructions prior to installation and operation of the unit.

CAUTION: Risk of electric shock.

DIMENSIONS  In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1” (53.4) H x 5” (127) W.
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Programming the Meter ................... 7

ORDERING INFORMATION

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>R0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>

R0 - 6 Digit Rate Meter
1. DISPLAY: 6-digit, 0.56” (14.2 mm), 7-segment LED. 
Decimal points are programmable from front panel keys.

2. POWER:
   AC Power: 115V/230 VAC, switch selectable. Allowable power line variation ±10%, 50/60 Hz, 6 VA, @ 100 mA max.
   Isolation: 2300 Vrms for 1 min. to input and DC Out/In.
   DC Power: 10 to 16 VDC @ 0.1 A max.

3. SENSOR POWER: 9 to 17.5 VDC @ 100 mA max.

4. KEYPAD: 3 programming keys, the ▼ (Down Arrow) key can also function as the front panel reset button.

5. INPUT: (DIP switch selectable)
   Accepts pulses from a variety of sources including NPN-OC, PNP-OC, TTL Outputs, Magnetic Pickups and all standard Red Lion® sensors.

6. INPUT FREQUENCY RANGE:
   Max Frequency: 25 KHz
   Min Frequency: 0.01 Hz
   Accuracy: ±0.01%

7. MEMORY: Nonvolatile E²PROM retains all programmable parameters and display values.

8. ENVIRONMENTAL CONDITIONS:
   Operating Temperature: 0° to 60°C
   Storage Temperature: -40° to 60°C
   Operating and Storage Humidity: 0 to 85% max. relative humidity (non-condensing)

   Vibration According to IEC 68-2-6: Operational 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2g's.
   Shock According to IEC 68-2-27: Operational 30 g (10g relay), 11 msec in 3 directions.
   Altitude: Up to 2000 meters

9. CERTIFICATIONS AND COMPLIANCES:
   SAFETY
   UL Recognized Component, File # E179259, UL61010A-1, CSA C22.2 No. 61010-1
   Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
   UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
   LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
   Type 4X Enclosure rating (Face only), UL50

   ELECTROMAGNETIC COMPATIBILITY
   Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

   IMMUNITY TO INDUSTRIAL LOCATIONS:
   Electric fields
   EN 61000-4-2: Criterion A
   4 kV contact discharge
   8 kV air discharge
   EN 61000-4-4: 2 kV power
   Electromagnetic fields
   EN 61000-4-3: 2 kV L-E power
   EN 61000-4-5: 4 kV contact discharge
   Surge
   EN 61000-4-5: 1 kV L-L, 2 kV L-N-E power
   EN 61000-4-8: 3 kV/L-N-E power
   Voltage dip/interruptions
   EN 61000-4-11: 30 A/m
   Notes:
   2. EMI filter placed on the DC power supply, when DC powered: Corcom #1VB3 or Schaffner #FM610-1/07 (RLC #LFIL0000).

   CONNECTIONS
   Wire Stripping Length: 0.3” (7.5 mm)
   Wire Gage Capacity: 30-14 AWG copper wire.

   WEIGHT: 12 oz (340 g)

1.0 INSTALLING THE METER

Installation
The PAX meets NEMA 4X/IP65 requirements when properly installed. The unit is intended to be mounted into an enclosed panel. Prepare the panel cutout to the dimensions shown. Remove the panel latch from the unit. Slide the panel gasket over the rear of the unit to the back of the bezel. The unit should be installed fully assembled. Insert the unit into the panel cutout.

Installation Environment
The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents. Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.
2.0 Setting the Switches

The meter has switches that must be checked and/or changed prior to applying power. To access the power switch, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Power Selection Switch

Caution: Insure the AC power selection switch is set for the proper voltage before powering-up the meter. The meter is shipped from the factory in the 230 VAC position.

Set-Up DIP Switches

A DIP switch is located at the rear of the meter, and is fully accessible when the unit is in the case. It is used for the selection of the input parameters and program disable.

SWITCH 1
SNK: Adds internal 7.8 kΩ pull-up resistor to + 12 VDC, I_{MAX} = 1.9 mA.
SWITCH 2
SRC: Adds internal 3.9 kΩ pull-down resistor, 8 mA max. @ 30 VDC max.

3.0 Wiring the Meter

Wiring Overview

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder.) Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

EMC Installation Guidelines

Although this meter is designed with a high degree of immunity to Electro-Magnetic 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 meter may be different for various installations. The meter 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 troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which 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 meter 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 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.
6. 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 # ZCAT3035-1303A
   - Steward # 28B2029-0A0
   - Note: Reference manufacturer’s instructions when installing a line filter.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
   Snubber: RLC# SNUB0000.
### 3.1 POWER WIRING

**AC Power**
- Terminal 1: VAC
- Terminal 2: VAC

**DC Power**
- Terminal 3: +VDC
- Terminal 4: COMM

### 3.2 INPUT WIRING

<table>
<thead>
<tr>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic Pickup</td>
<td><img src="image" alt="Magnetic Pickup Diagram" /></td>
</tr>
<tr>
<td>AC Inputs From Tach Generators, Etc.</td>
<td><img src="image" alt="AC Inputs Diagram" /></td>
</tr>
<tr>
<td>Two Wire Proximity, Current Source</td>
<td><img src="image" alt="Two Wire Diagram" /></td>
</tr>
<tr>
<td>Current Sinking Output</td>
<td><img src="image" alt="Current Sinking Diagram" /></td>
</tr>
<tr>
<td>Current Sourcing Output</td>
<td><img src="image" alt="Current Sourcing Diagram" /></td>
</tr>
<tr>
<td>Interfacing With TTL</td>
<td><img src="image" alt="Interfacing TTL Diagram" /></td>
</tr>
<tr>
<td>Emitter Follower; Current Source</td>
<td><img src="image" alt="Emitter Follower Diagram" /></td>
</tr>
</tbody>
</table>

*Switch position is application dependent.*
4.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

![Front Buttons and Display](image)

5.0 SCALING THE METER

RATE SCALING

To scale the Rate, enter a Scaling Display value with a corresponding Scaling Input value. These values are internally plotted to a Display value of 0 and Input value of 0 Hz. A linear relationship is formed between these points to yield a rate display value that corresponds to the incoming input signal rate. The location of the scaling point should be near the process end limit for the best possible accuracy. The PAXLR is capable of showing a rate display value for any linear process.

SCALING CALCULATION

If a display value versus input signal (in pulses per second) is known, then those values can be entered into Scaling Display (SU41) and Scaling Input (SU*/1). No further calculations are needed.

If only the number of pulses per 'single' unit (i.e. # of pulses per foot) is known, then it can be entered as the Scaling Input value and the Scaling Display value will be entered as the following:

### NOTES:

1. If # of pulses per unit is less than 10, then multiply both Input and Display values by 10.
2. If # of pulses per unit is less than 1, then multiply both Input and Display values by 100.
3. If the Display value is raised or lowered, then Input value must be raised or lowered by the same proportion (i.e. Display value for per hour is entered by a third less (1200) then Input value is a third less of # of pulses per unit). The same is true if the Input value is raised or lowered, then Display value must be raised or lowered by the same proportion.
4. Both values must be greater than 0.0.

**EXAMPLE:**

1. With 15.1 pulses per foot, show feet per minute in tenths.
   - Scaling Display = 60.0
   - Scaling Input = 15.1

2. With 0.25 pulses per gallon, show whole gallons per hour. (To have greater accuracy, multiply both Input and Display values by 10.)
   - Scaling Display = 3600
   - Scaling Input = 2.5

RATE DISPLAY OVERFLOW

The rate of the input signal along with the programmed scaling values can cause the calculated rate display to exceed the meter’s 6-digit capacity. If this occurs, the display will show “000000” to indicate an overflow condition.

<table>
<thead>
<tr>
<th>RATE PER</th>
<th>DISPLAY (rt·dSP)</th>
<th>INPUT (rt·INP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>1</td>
<td># of pulses per unit</td>
</tr>
<tr>
<td>Minute</td>
<td>60</td>
<td># of pulses per unit</td>
</tr>
<tr>
<td>Hour</td>
<td>3600</td>
<td># of pulses per unit</td>
</tr>
</tbody>
</table>

INPUT FREQUENCY CALCULATION

The meter determines the input frequency by summing the number of falling edges received during a sample period of time. The sample period begins on the first falling edge. At this falling edge, the meter starts accumulating time towards Low Update and High Update values. Also, the meter starts accumulating the number of falling edges. When the time reaches the Low Update Time value, the meter looks for one more falling edge to end the sample period. If a falling edge occurs (before the High Update Time value is reached), the Rate display will update to the new value and the next sample period will start on the same edge. If the High Update Time value is reached (without receiving a falling edge after reaching Low Update Time), then the sample period will end but the Rate display will be forced to zero. The High Update Time value must be greater than the Low Update Time value. Both values must be greater than 0.0. The input frequency calculated during the sample period, is then shown as a Rate value determined by either scaling method.
The Rate Indicator has five programmable parameters which are entered in the sequence shown above, using the front panel push buttons.

Before programming, refer to the section on Scaling the Meter to determine the Rate Scaling Display Value and Rate Scaling Input Value to use for the specific application.

Note: Programming mode can be locked out with the Program Disable DIP switch. With the switch in the Disabled (up) position the meter will not enter programming mode. Refer to the section on DIP switch setup.

**PROGRAMMING MODE ENTRY**
Press the PAR key to enter Programming Mode. The meter briefly displays \( \text{Pr} \) followed by the first programming parameter described below.

**PROGRAMMING PARAMETERS**
In programming mode, the display alternates between the parameter and the current selection or value for that parameter. The dual display with arrows is used below to illustrate the alternating display. The selection choices or value range for each parameter is shown to the right of the alternating display.

### DECIMAL POSITION

The parameters which follow are displayed as a multi-digit numerical values with one selected digit flashing (initially the far left digit). Press the \( \uparrow \) (up arrow) key to increment the value of the selected (flashing) digit. Holding the \( \uparrow \) key automatically scrolls the value of the selected digit.

Press the \( \downarrow \) (down arrow) key to select the next digit position to the right. Use the \( \downarrow \) key again to select the next digit to be changed. Holding the \( \downarrow \) key automatically scrolls through each digit position.

Repeat the “select and set” sequence until all digits are displaying the desired numerical value. Press the PAR key to save the displayed value and advance to the next parameter.

### ENTERING NUMERICAL VALUES

The parameters which follow are displayed as a multi-digit numerical values with one selected digit flashing (initially the far left digit). Press the \( \uparrow \) (up arrow) key to increment the value of the selected (flashing) digit. Holding the \( \uparrow \) key automatically scrolls the value of the selected digit.

Press the \( \downarrow \) (down arrow) key to select the next digit position to the right. Use the \( \downarrow \) key to increment the value of this digit to the desired number. Press the \( \downarrow \) key again to select the next digit to be changed. Holding the \( \downarrow \) key automatically scrolls through each digit position.

Repeat the “select and set” sequence until all digits are displaying the desired numerical value. Press the PAR key to save the displayed value and advance to the next parameter.

### LOW UPDATE TIME (DISPLAY UPDATE)

The Low Update Time is the minimum amount of time between display updates. The factory setting of 1.0 allows a minimum of one second between updates. Low values below 0.3 seconds will update the display correctly, but may cause the display to appear unsteady.

For more details on display updating, refer to Input Frequency Calculation.

### HIGH UPDATE TIME (DISPLAY ZERO)

The High Update Time is the maximum amount of time before the display is forced to zero. The High Update Time must be higher than the Low Update Time and also higher than the desired slowest readable speed (one divided by pulses per second). The factory setting of 2.0 will force the display to zero for speeds below 0.5 Hz or one pulse every 2 seconds.

For more details on display updating, refer to Input Frequency Calculation.

### RATE SCALING DISPLAY VALUE

Enter the desired Rate Display value to be shown for the corresponding Rate Input value entered below. For more explanation, refer to Rate Scaling.

### RATE SCALING INPUT VALUE

Enter the Rate Input value that corresponds to the Rate Display value entered above. This value is always in pulses per second (Hz). For more explanation, refer to Rate Scaling.

### PROGRAMMING MODE EXIT

The meter exits Programming Mode when the PAR key is pressed to save the Rate Scaling Input Value. The meter briefly displays \( \text{End} \) upon exiting Programming Mode. All programmed selections are now transferred to the non-volatile memory and the meter returns to the Rate display.

If power loss occurs during programming mode, verify parameter changes and reprogram, if necessary, when power is restored.

### PROGRAMMING MODE TIME OUT

The Programming Mode has an automatic time out feature. If no keypad activity is detected for approximately 60 seconds, the meter automatically exits Programming Mode. The meter briefly displays \( \text{End} \) and returns to the Rate display. When automatic timeout occurs, any changes that were made to the parameter currently being programmed, will not be saved.

### FACTORY SETTINGS

The factory settings for the programming parameters are shown above in the alternating display illustrations. The factory settings can be easily restored by removing power from the meter, and then pressing and holding the PAR key while power is reapplied. The meter displays \( \text{fESet} \) until the PAR key is released. The normal power-up sequence then resumes, with the factory settings loaded and saved in non-volatile memory.

Note: The Program Disable DIP switch must be in the Enabled (down) position to allow loading factory settings. See section on DIP switch setup.
MODEL PAXLCR - 1/8 DIN PAX LITE DUAL COUNTER AND RATE METER

This is a brief overview of the PAXLCR. For complete specifications and programming information, see the PAX Lite Dual Counter and Rate Meter Bulletin starting on page 125.

ANNUNCIATORS:
- A - Counter A value
- B - Counter B value (dual count or batch)
- Rate value is displayed with no designator
- SP1 - Indicates setpoint 1 output status
- SP2 - Indicates setpoint 2 output status

COUNTER DISPLAYS:
- Counter A: 6-digits, enabled in all count modes
  Display Designator: “A” to the left side of the display
  Display Range: -999999 to 999999
- Counter B: 6-digits, enabled in Dual Count mode or Batch Counter
  Display Designator: “B” to the left side of the display
  Display Range: 0 to 999999 (positive count only)
- Overflow Indication: Display “0-0-” alternates with overflowed count value
- Maximum Count Rates: 50% duty cycle, count mode dependent.
  With setpoints disabled: 25 KHz, all modes except Quadrature x4 (23 KHz).
  With setpoint(s) enabled: 20 KHz, all modes except Dual Counter (14 KHz),
  Quadrature x2 (13 KHz) and Quadrature x4 (12 KHz).

RATE DISPLAY: 6-digits, may be enabled or disabled in any count mode
- Display Range: 0 to 999999
- Over Range Display: “0-0-”
- Maximum Frequency: 25 KHz
- Minimum Frequency: 0.01 Hz
- Accuracy: ±0.01%

COUNT/RATE SIGNAL INPUTS (INPUT A and INPUT B):
See Section 2.0 Setting the DIP Switches for complete Input specifications.
DIP switch selectable inputs accept pulses from a variety of sources. Both inputs allow selectable active low or active high logic, and selectable input filtering for low frequency signals or switch contact debounce.
- Input A: Logic level or magnetic pickup signals.
  Trigger levels: VIL = 1.25 V max; VIH = 2.75 V min; VMAX = 28 VDC
  Mag. pickup sensitivity: 200 mV peak, 100 mV hysteresis, 40 V peak max.
- Input B: Logic level signals only
  Trigger levels: VIH = 1.0 V max; VIL = 2.4 V min; VMAX = 28 VDC
MODEL PAXR - 1/8 DIN RATE METER

This is a brief overview of the PAXR. For complete specifications and programming information, see the PAX Digital Input Panel Meters Bulletin starting on page 137.

**PAXR SPECIFICATIONS**

**ANNUNCIATORS:**
- **r** - Rate
- **H** - Maximum (High) Rate
- **L** - Minimum (Low) Rate
- SP1 - setpoint 1 output state
- SP2 - setpoint 2 output state
- SP3 - setpoint 3 output state
- SP4 - setpoint 4 output state

**RATE DISPLAY:**
- Accuracy: ±0.01%
- Minimum Frequency: 0.01 Hz
- Maximum Frequency: 34 KHz
- Maximum Display: 5 Digits: 99999
- Adjustable Display (low) Update: 0.1 to 99.9 seconds
- Over Range Display: “r DL DL”

**INPUT A:**
- DIP switch selectable to accept pulses from a variety of sources including TTL outputs, magnetic pickups and all standard RLC sensors.
- LOGIC: Input trigger levels $V_{IL} = 1.5$ V max.; $V_{IH} = 3.75$ V min.
  - Current sinking: Internal $7.8 \, \Omega$ pull-up to $+12$ VDC, $I_{MAX} = 1.9$ mA.
  - Current sourcing: Internal $3.9 \, \Omega$ pull-down, $7.3$ mA max. @ $28$ VDC, $V_{MAX} = 30$ VDC.
- MAGNETIC PICKUP:
  - Sensitivity: $200$ mV peak
  - Hysteresis: $100$ mV
  - Input impedance: $3.9 \, \Omega$ @ $60$ Hz
  - Maximum input voltage: ±$40$ V peak, $30$ Vrms

- 5-DIGIT 0.56” RED SUNLIGHT READABLE OR STANDARD GREEN DISPLAY
- RATE INDICATION
- MINIMUM/MAXIMUM RATE DISPLAYS
- FOUR SETPOINT ALARM OUTPUTS (W/Plug-in card)
- VARIABLE INTENSITY DISPLAY

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**MODEL PAXI - 1/8 DIN DUAL COUNTER/RATE METER**

This is a brief overview of the PAXI. For complete specifications and programming information, see the PAX Digital Input Panel Meters Bulletin starting on page 137.

### PAXI SPECIFICATIONS

**MAXIMUM SIGNAL FREQUENCIES TABLE**

To determine the maximum frequency for the input(s), first answer the questions with a yes (Y) or no (N). Next determine the Count Mode to be used for the counter(s). If dual counters are used with different Count Modes, then the lowest frequency applies to both counters.

<table>
<thead>
<tr>
<th>FUNCTION QUESTIONS</th>
<th>Single: Counter A or B (with/without rate) or Rate only</th>
<th>Dual: Counter A &amp; B or Rate not assigned to active single counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are any setpoints used?</td>
<td>N N N N Y Y Y Y</td>
<td>N N N N Y Y Y Y</td>
</tr>
<tr>
<td>Is Prescaler Output used?</td>
<td>N Y N Y N Y N Y</td>
<td>N Y N Y N Y N Y</td>
</tr>
<tr>
<td>Is Counter C used?</td>
<td>N Y N Y N Y N Y</td>
<td>N Y N Y N Y N Y</td>
</tr>
<tr>
<td>COUNT MODE</td>
<td>(Values are in KHz)</td>
<td>(Values are in KHz)</td>
</tr>
<tr>
<td>Count x1</td>
<td>34 25 21 17</td>
<td>13 12 11 11</td>
</tr>
<tr>
<td>Count x2</td>
<td>17 13 16 12</td>
<td>9 7 7 7</td>
</tr>
<tr>
<td>Quadrature x1</td>
<td>22 19 20 17</td>
<td>7 * 6 * 6 * 5 *</td>
</tr>
<tr>
<td>Quadrature x2</td>
<td>17 13 16 12</td>
<td>7 * 6 * 6 * 5 *</td>
</tr>
<tr>
<td>Quadrature x4</td>
<td>8 6 8 6</td>
<td>4 3 4 3</td>
</tr>
<tr>
<td>Rate Only</td>
<td>34 N/A 21 N/A</td>
<td>34 N/A 21 N/A</td>
</tr>
</tbody>
</table>

**ANNUNCIATORS:**

- A - Counter A
- B - Counter B
- C - Counter C
- r - Rate
- H - Maximum (High) Rate
- L - Minimum (Low) Rate
- DF - Upper significant digit display of counter
- SP1 - setpoint 1 output state
- SP2 - setpoint 2 output state
- SP3 - setpoint 3 output state
- SP4 - setpoint 4 output state

**RATE DISPLAY:**

- Accuracy: ±0.01%
- Minimum Frequency: 0.01 Hz
- Maximum Frequency: see Max Signal Frequencies Table.
- Maximum Display: 5 Digits: 99999
- Adjustable Display (low) Update: 0.1 to 99.9 seconds
- Over Range Display: “r 4L4L”

**COUNTER DISPLAYS:**

- Maximum display: 8 digits: ± 99999999 (greater than 6 digits display
- Alternates between high order and low order.)

**INPUTS A and B:**

DIP switch selectable to accept pulses from a variety of sources including switch contacts, TTL outputs, magnetic pickups and all standard RLC sensors.

- **LOGIC:** Input trigger levels $V_R = 1.5$ V max.; $V_H = 3.75$ V min.
- Current sinking: Internal 7.8 KΩ pull-up to +12 VDC, $I_{\text{MAX}} = 1.9$ mA.
- Current sourcing: Internal 3.9 KΩ pull-down, 7.3 mA max. @ 28 VDC, $V_{\text{MAX}} = 30$ VDC.
- Filter: Damping capacitor provided for switch contact bounce. Limits input frequency to 50 Hz and input pulse widths to 10 msec. minimum.

**MAGNETIC PICKUP:**

- Sensitivity: 200 mV peak
- Hysteresis: 100 mV
- Input impedance: 3.9 KΩ @ 60 Hz
- Maximum input voltage: ±40 V peak, 30 Vrms

**DUAL COUNT MODES:**

When any dual count mode is used, then User Inputs 1 and/or 2 will accept the second signal of each signal pair. The user inputs do not have the Logic/Mag, HI/LO Freq, and Sink/Source input setup switches. The user inputs are inherently a logic input with no low frequency filtering. Any mechanical contacts used for these inputs in a dual count mode must be debounced externally. The user input may only be selected for sink/source by the User Jumper placement.

**PRESCALER OUTPUT:**

- NPN Open Collector: $I_{\text{OL}} = 100$ mA max. @ $V_{\text{OL}} = 1$ VDC max. $V_{\text{OL}} = 30$ VDC max. With duty cycle of 25% min. and 50% max.
MODEL PAXLPT - PAX® LITE PROCESS TIME METER

**GENERAL DESCRIPTION**

The PAX® Lite Process Time Meter, Model PAXLPT, displays a value representing the time between a beginning and end point of a process, such as a conveyor oven.

The PAXLPT’s display will update inversely in relation to the input signal frequency. As input frequency increases (representing speed), the PAXLPT time display will decrease indicating a reduction in the duration of process time. For example, the bake time through an oven will decrease the faster the conveyor runs.

The display can be programmed for two operating modes. Operating in the 6 digit mode, the PAXLPT can readout in any whole value, such as seconds, minutes, or hours. This mode also provides capability for decimal points. The 5 digit mode functions as a chronometer, which has a maximum display value of 999-59. This formats the display to allow the meter to readout in hours and minutes, minutes and seconds, etc.

The PAX® Lite Process Time Indicator also has a feature called “moving window average”. This allows one time disturbances, or irregularly spaced items to be averaged over eight inputs, thus keeping display fluctuations to a minimum while still updating the display on every pulse. This feature can be enabled or disabled by a rear DIP switch.

The PAXLPT can accept many different types of sensors including magnetic pickups, logic sensors, and NPN open collector sensors, as well as switch contact closure sensors.

The meter has been specifically designed for harsh industrial environments. With a NEMA 4X/IP65 sealed bezel and extensive testing to meet CE requirements, the meter provides a tough yet reliable application solution.

**SAFETY SUMMARY**

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

**DIMENSIONS** In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1” (53.4) H x 5” (127) W.
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Ordering Information

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>PT</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>

PT - 6 Digit Process Time Meter

This document provided by Barr-Thorp Electric Co., Inc. 800-473-9123 www.barr-thorp.com
1. DISPLAY: 6-digit, 0.56" (14.2 mm), 7-segment LED.
   Decimal points are programmed by front panel keys (6 digit mode only)
2. POWER:
   AC Power: 115/230 VAC, switch selectable. Allowable power line variation ±10%, 50/60 Hz, 6 VA.
   DC Power: 10 to 16 VDC @ 0.1 A max.
   Isolation: 2300 Vrms for 1 min. to input and DC Out/In.
3. SENSOR POWER: 9 to 17.5 VDC @ 100 mA max.
4. KEYPAD: 3 programming keys
5. INPUT: (DIP switch selectable)
   Accepts pulses from a variety of sources including NPN-OC, PNP-OC, TTL. 
   Outputs, Magnetic Pickups and all standard Red Lion™ sensors.
   Logic State: Active Low
   Input trigger levels: \( V_{IL} = 1.5 \text{ V max.}; V_{IH} = 3.75 \text{ V min.} \)
   Current Sinking: Internal 7.8 KΩ pull-up to +12 VDC, \( I_{MAX} = 1.9 \text{ mA} \)
   Current Source: Internal 3.9 KΩ pull-down, 8 mA max. @ 30 VDC max.
6. MAGNETIC PICK-UP:
   Sensitivity: 200 mV peak
   Hysteresis: 100 mV
   Input impedance: 3.9KΩ @ 60 Hz
   Maximum input voltage: ±40 V peak, 30 Vrms
7. MEMORY: Nonvolatile E²PROM retains all programmable parameters.
8. ENVIRONMENTAL CONDITIONS:
   Operating Temperature: 0° to 60°C
   Storage Temperature: -40° to 60°C
   Operating and Storage Humidity: 0 to 85% max. relative humidity (non-condensing)
   Vibration According to IEC 68-2-6: Operational 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2g's.
   Shock According to IEC 68-2-27: Operational 25 g (10g relay), 11 msec in 3 directions.
   Altitude: Up to 2000 meters
9. CERTIFICATIONS AND COMPLIANCES:
   SAFETY
   UL Recognized Component, File # E179259, UL61010A-1, CSA C22.2 No. 61010-1
   Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
   UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
   LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
   Type 4X Enclosure rating (Face only), UL50
   IEC/IEEE CB Scheme Test Certificate # US/8843A/UL
   CB Scheme Test Report # 04ME11209-20041018
   Issued by Underwriters Laboratories, Inc.
   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
   IP20 Enclosure rating (Rear of unit), IEC 529
   ELECTROMAGNETIC COMPATIBILITY
   Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.
   Immunity to Industrial Locations:
   Electrostatic discharge EN 61000-4-2 - Criterion A
   Electromagnetic RF fields EN 61000-4-3 - Criterion A
   Fast transients (burst) EN 61000-4-4 - Criterion A
   Surge EN 61000-4-5 - Criterion A
   RF conducted interference EN 61000-4-6 - Criterion A
   Power frequency magnetic fields EN 61000-4-8 - Criterion A
   Voltage dip/interruptions EN 61000-4-11 - Criterion A
   Emissions:
   Emissions EN 55011 - Class B
   Notes:
   2. EMI filter placed on the DC power supply, when DC powered: Corcom #1VB3 or Schaffner #FN610-1/07 (RLC #LFIL0000).
10. CONNECTIONS: High compression cage-clamp terminal block
    Wire Strip Length: 0.3" (7.5 mm)
    Wire Gage Capacity: 30-14 AWG copper wire.
    Torque: 4.5 inch-lbs (0.51 N-m) max.
11. CONSTRUCTION: This unit is rated for NEMA 4X/IP65 outdoor use.
12. WEIGHT: 12 oz (340 g)

1.0 INSTALLING THE METER

Installation
The PAX meets NEMA 4X/IP65 requirements when properly installed. The unit is intended to be mounted into an enclosed panel. Prepare the panel cutout to the dimensions shown. Remove the panel latch from the unit. Slide the panel gasket over the rear of the unit to the back of the bezel. The unit should be installed fully assembled. Insert the panel latch over the rear of the unit so that the tabs of the panel latch engage in the slots on the case. The panel latch should be engaged in the farthest forward slot possible. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (Torque to approximately 7 in-lbs [79N-cm]). Do not over-tighten the screws.

Installation Environment
The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents. Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

![Panel Cut-Out](image-url)
2.0 SETTING THE JUMPER AND SWITCHES

The meter has a jumper and switches, which must be checked and/or changed prior to applying power. To access the power switch and the jumper, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Power Selection Switch

Caution: Insure the AC power selection switch is set for the proper voltage before powering-up the meter. The meter is shipped from the factory in the 230 VAC position.

Mode Selection Jumper

Inside the meter is also the Mode Selection Jumper, located near the display board. This jumper will select operation in the 6 digit mode or 5 digit (chronometer) mode. When the jumper is positioned toward the display board, the unit will be in the 6 digit mode of operation. With the jumper positioned away from the display board, the meter is in the 5 digit (chronometer) mode. This unit ships from the factory in the 6 digit mode.

Set-Up DIP Switches

A DIP switch is located at the rear of the meter, and is fully accessible when the unit is in the case. It is used for the selection of the input parameters and program disable. For the correct input setup, refer to 3.2 Input Wiring.

3.0 WIRING THE METER

WIRING OVERVIEW

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder.) Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic 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 meter may be different for various installations. The meter 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 troublesome installation.

Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which 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 meter 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 as possible from contacts, 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 # FN670-1/807 Corcom # 1 VR3
   - 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.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI. Snubber: RLC# SNUB0000.
3.1 POWER WIRING

AC Power
Terminal 1: VAC
Terminal 2: VAC

DC Power
Terminal 3: +VDC
Terminal 4: COMM

3.2 INPUT WIRING

Magnetic Pickup

AC Inputs From Tach Generators, Etc.

Two Wire Proximity, Current Source

Current Sinking Output

Current Sourcing Output

Interfacing With TTL

Emitter Follower; Current Source

*Switch position is application dependent.
4.0 Reviewing the Front Buttons and Display

In many industrial applications, a meter is required to display the process time of an operation or event. The pulses from a sensor are received by the PAXLPT, and then scaled to produce just such a readout. The following formula will help provide the scaling values to achieve the desired readout.

\[ SF = DR \times PPS \]

**WHERE:**
- \( SF \) = Scale Factor
- \( DR \) = Desired Readout*
- \( PPS \) = Pulses per Second

To calculate the PPS multiply the RPM (Revolutions per Minute) by the PPR (Pulses per Revolution) and divide by 60.

\[ \frac{RPM \times PPR}{60} \]

*For applications requiring a decimal point, select and program the appropriate decimal point. When calculating the Scale Factor, use the whole value of the number to be displayed, for example, 50.0 minutes, the Desired Readout in this case is 500. Do not use decimal points in the Desired Readout when calculating the scale factor.

For calculated SF values less than 59,999

If the Scale Factor is a value less than 59,999, it can be entered directly into the meter as the Scale Factor and the Scale Multiplier can be left at 1.

For calculated SF values greater than 59,999

If the Scale Factor is a value over 59,999 (maximum value), the Scale Multiplier must be used to reduce the calculated Scale Factor value until it is less than 59,999. The Scale Multiplier divides the calculated Scale Factor value by 1, 10, 100 and 1000, thus reducing the calculated value accordingly. Select the appropriate Scale Multiplier value that allows the Scale Factor to be a value under 59,999. Both the Scale Factor and Scale Multiplier can then be entered into the meter.

Example 1 (6 Digit):

\[ DR = 150 \text{ minutes} \]
\[ PPS = \frac{450 \text{ RPM} \times 60 \text{ PPR}}{60} \]
\[ PPS = 450 \]
\[ SF = DR \times PPS \]
\[ SF = 150 \times 450 \]
\[ SF = 67,500 \]

Since the SF value is greater than 59,999, the SM will be needed to reduce the calculated value to value less than 59,999. Using the SM of 10, the 67,500 value is divide by 10, reducing the SF to a value of 6750. The meter can be programmed for a SF of 6750 and a SM of 10.

Example 2 (5 Digit):

\[ DR = 2 \text{ hours and } 23 \text{ minutes (2-23)} \]
\[ PPS = \frac{138 \text{ RPM} \times 100 \text{ PPR}}{60} \]
\[ PPS = 230 \]

To calculate the Scale Factor for a 5 Digit application, first convert the DR to its base units.

\[ DR = 2 \times 60 + 23 \]
\[ DR = 120 + 23 \]
\[ DR = 143 \text{ minutes} \]
\[ SF = DR \times PPS \]
\[ SF = 143 \times 230 \]
\[ SF = 32,890 \]

Since the SF value is less than 59,999, it can be entered directly as the SF and the SM will be 1. Note: When programmed for the 5 Digit mode, the meter will convert the D.R. back to the hours and minutes format.

5.0 Scaling the Meter

<table>
<thead>
<tr>
<th>KEY</th>
<th>DISPLAY MODE OPERATION</th>
<th>PROGRAMMING MODE OPERATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAR</td>
<td>Access Programming Mode</td>
<td>Store selected parameter and index to next parameter</td>
</tr>
<tr>
<td>▲</td>
<td>No Function</td>
<td>Increment selected digit of parameter value</td>
</tr>
<tr>
<td>▼</td>
<td>No Function</td>
<td>Select digit position in parameter value</td>
</tr>
</tbody>
</table>

---

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6.0 Programming the Meter

The Process Time Indicator has three programmable parameters which are entered in the sequence shown above, using the front panel push buttons. Before programming, please refer to the section on Scaling the Meter to determine the Decimal Position, Scale Factor and Scale Multiplier to use for the specific application.

Note: Programming mode can be locked out with the Program Disable DIP switch. With the switch in the Disabled (up) position the meter will not enter programming mode. Refer to the section on DIP switch setup.

PROGRAMMING MODE ENTRY
Press the PAR key to enter Programming Mode. The meter briefly displays 1SP followed by the first programming parameter described below.

PROGRAMMING PARAMETERS
In programming mode, the display alternates between the parameter and the current selection or value for that parameter. The dual display with arrows is used below to illustrate the alternating display. The selection choices or value range for each parameter is shown to the right of the alternating display.

DECIMAL POSITION (6-digit version only)

This parameter selects the decimal point position on the display. The selection is used when calculating the Scale Factor. This parameter only appears when the meter is configured for the conventional (6-digit) display.

Press the arrow keys (▲ or ▼) to sequence through the selection list until the desired selection is shown. Press the PAR key to save the displayed selection and advance to the next parameter.

SCALE FACTOR

The Scale Factor is used in combination with the Scale Multiplier to obtain the desired process time readout. (See details on Scaling the Meter.)

The Scale Factor is displayed as a five-digit value with one selected digit flashing (initially digit 5). Press the ▲ (up arrow) key to increment the value of the selected (flashing) digit. Holding the ▲ key automatically scrolls the value of the selected digit.

Press the ▼ (down arrow) key to select the next digit position to the right. Use the ▲ key to increment the value of this digit to the desired number. Press the ▼ key again to select the next digit to be changed. Repeat the "select and set" sequence until all digits are displaying the desired Scale Factor value. Press the PAR key to save the displayed value and advance to the next parameter. Holding the ▼ key automatically scrolls through each digit position.

SCALE MULTIPLIER

The Scale Multiplier is used in combination with the Scale Factor to obtain the desired process time readout. (See details on Scaling the Meter.)

Press the arrow keys (▲ or ▼) to sequence through the selection list until the desired selection is displayed. Press the PAR key to save the selection and exit programming mode.

PROGRAMMING MODE EXIT
The meter exits Programming Mode when the PAR key is pressed to save the Scale Multiplier selection. The meter briefly displays End upon exiting Programming Mode. All programmed selections are now transferred to the non-volatile memory and the meter returns to the Process Time display. (If power loss occurs during programming mode, verify parameter changes and reprogram, if necessary, when power is restored.)

PROGRAMMING MODE TIME OUT
The Programming Mode has an automatic time out feature. If no keypad activity is detected for approximately 60 seconds, the meter automatically exits Programming Mode. The meter briefly displays End and returns to the Process Time display. When automatic timeout occurs, any changes that were made to the parameter currently being programmed, will not be saved.

FACTORY SETTINGS
The factory settings for the programming parameters are shown above in the alternating display illustrations. The factory settings can be easily restored by removing power from the meter, and then pressing and holding the PAR key while power is reapplied. The meter displays RESET until the PAR key is released. The normal power-up sequence then resumes, with the factory settings loaded and saved in non-volatile memory.

Note: The Program Disable DIP switch must be in the Enabled (down) position to allow loading factory settings. See section on DIP switch setup.
MOTOR DRIVE CONTROLLER

- **MASTER AND FOLLOWER MODES OF OPERATION**
- **PROGRAMMABLE SETPOINTS:**
  - TWO SPEED (Master)
  - TWO RAMP RATE (Master)
  - TWO RATIO (Follower)
  - TWO RATIO RAMP RATE (Follower)
  - ONE JOG SPEED
  - ONE JOG RAMP RATE
- **8 CHARACTER BY 2 LINE ALPHANUMERIC DISPLAY**
- **FOUR PROGRAMMABLE INDICATION DISPLAYS**

**DESCRIPTION**

The Motor Drive Controller (MDC) regulates motor speed by varying an isolated DC control signal to a motor drive system. There are two modes of operation, Master and Follower.

Master Mode provides control of a motor directly via programmed speed setpoints in the MDC. Regulation is maintained by a feedback frequency to the MDC taken from the motor shaft or a downstream shaft pulse encoder. Follower Mode controls a motor’s speed as a ratio to a second motor’s speed or outside frequency source. Ratio setpoints are programmed into the MDC causing the motor to “follow” the lead motor or frequency at a fixed speed ratio.

Master Mode has two speed setpoints and two ramp setpoints. Follower Mode has two ratio setpoints and two ramp setpoints. Both modes share a jog speed setpoint and a jog ramp setpoint. All setpoints are retained in non-volatile memory when the unit is powered down.

The Motor Drive Controller has the added feature of allowing real time adjustment of the Speed (Master Mode) or Ratio (Follower Mode) setpoint while the unit is operating a motor drive system. The setpoint may be adjusted via the front panel keypad using the “Up” or “Down” arrow keys, or via 2 User Inputs programmed for increment setpoint and decrement setpoint.

User flexibility is provided through the two-line by eight-character alphanumeric display. The display features English language menus for easy viewing and simplified programming. The four scroll-through indication displays can be programmed to show various parameters and to automatically scroll, if desired. A program disable DIP switch used with an external User Input can be utilized to protect the settings and guarantee that no unwanted changes occur during operation.

There are five dedicated control inputs on the MDC:
- RUN
- RAMP STOP
- FAST STOP
- JOG
- OPEN LOOP

There are six programmable control inputs: two front panel function keys and four remote user inputs. The F1 and F2 keys are factory programmed for RUN and R-STOP respectively. This eliminates the need for external switches in some applications.

There are three solid state outputs, two are programmable alarms and one is a dedicated Drive Enable output. Programmable alarm functions include:
- High Alarm
- Low Alarm
- Deviation Alarm
- Zero Speed
- Disabled

These may be programmed for boundary or latching operation, high or low acting.

Changing speed setpoints and programming information is easily accomplished by scrolling through menus and selecting the correct parameter. There are three main modules or menu loops:
- Display Module
- User Setpoint Module
- Programming Module

Scaling is accomplished by entering the desired values for feedback pulses per revolution (PPR), the maximum RPM, and the maximum display value.

**DIMENSIONS In inches (mm)**

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 3.0” (76.2) H x 4.0” (101.6) W.
DESCRIPTION (Cont’d)

The unit is factory configured for an isolated 0 to 10 VDC drive output signal. The output drive signal can be adjusted from 0 to 15 VDC via an accessible potentiometer. The drive output is jumper selectable for an external reference. To use the external reference, the MDC is connected to the drive in place of an external potentiometer. The Motor Drive Controller has a light weight, high impact plastic case with a clear viewing window. The sealed front panel meets NEMA 4X/IP65 specifications for wash-down and/or dusty environments, when properly installed. Plug-in style terminal blocks simplify installation and wiring change-outs.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so, can be potentially harmful to persons or equipment in the event of a fault to the unit.

SPECIFICATIONS:

1. DISPLAY: 2x8, 0.3” (7 mm) high characters, negative image transmissive LCD, with red LED backlighting.
2. POWER: 115/230 VAC ±10%, 50/60 Hz, 10 VA, switch selectable.
3. MEMORY: Non-volatile EPROM retains all programming information and values when power is removed or interrupted.
4. SENSOR POWER: +12 VDC ±25% @ 100 mA.
5. INPUTS (LEAD AND FEEDBACK): DIP Switch selectable to accept input pulses from a variety of sources including outputs from CMOS or TTL circuits and all standard RLC sensors.

Input Freq: 1 Hz to 20 KHz (Master Mode), 1 Hz to 12 KHz (Follower Mode).
Logic: Input trigger levels Vl = 1.5 VMAX, VH = 3.75 VMIN.
Current Sinking: Internal 7.8 KΩ pull-up to +12 VDC, IMAX = 1.6 mA.
Current Source: Internal 3.9 KΩ pull-down, 7.3 mA @ 28 VDCMAX.
Magnetic Pickup: Sensitivity: 200 mV PEAK.
Hysteresis: 100 mV.
Input impedance: 3.9 KΩ @ 60 Hz.
Maximum input voltage: ±50 V PEAK.
Note: For magnetic pickup input, the SinkSource DIP switch must be in the SRC position.
6. CONTROL LOOP RESPONSE: 10 msec (Master Mode), 20 msec (Follower Mode).
7. CONTROL ACCURACY:
   - 0.01% of Speed Setpoint (Master Mode)
   - 0.02% of Ratio Setpoint (Follower Mode)

Minimum Frequency Resolution: 0.00125 Hz
8. ERROR TRIM: ±4095 BITS.
9. ERROR GAIN: 0 to 999%.
10. RAMP RATE: (Ramp 1, Ramp 2, and Jog Ramp)
    - 1 Hz to 20 KHz/sec, set in user units/sec.
    - 0.0001 to 1.9999 ratio units/sec (Ramp 1 & 2 in Follower Mode).
11. CONTROL INPUTS:
    - Internal 10 KΩ pull-up to +5 VDC, VIL = 1.0 VMAX, VIH = 4.0 VMIN.
    - Response time = 10 msec nominal, 30 msec max.
    - INPUTS: SWITCH CONNECTIONS
      - RUN: Momentary N.O.
      - FAST STOP: Momentary N.C.
      - RAMP STOP: Momentary N.C.
      - JOG: Sustained N.O.
      - OPEN LOOP: Maintained
      - USER INPUTS(4): Function Specific

12. OUTPUTS:
    - Drive Enable, Alarm 1, and Alarm 2:
      - Solid state, current sinking NPN Open collector transistor.
      - VIL = 1.1 VSAT @ 100 mA max., VIH = 30 VDC max.
      - (Internal zener diode protection.)
    - Response Time:
      - Drive Enable: 10 msec nominal; 30 msec max.
      - Alarm 1&2: Programmable
        - Normal: 1 sec nominal, 2 sec max.
        - Fast: 20 msec nominal, 40 msec max.
    - Isolated Drive Output: Jumper selectable internal/external reference 5 mA max.
    - Internal Reference: Pot adjustable from 0 to 5 VDC min. through 0 to 15 VDC max. span.

External Reference: 15 VDC max. (positive polarity only).
Isolation: 2300 Vrms for 1 minute
250 V working

13. CERTIFICATIONS AND COMPLIANCES:

ELECTROMAGNETIC COMPATIBILITY

Immunity to EN 60082-2
- Electrostatic discharge EN 61000-4-2 Level 2; 4 Kv contact Level 3; 8 Kv air
- Electromagnetic RF fields EN 61000-4-3 Level 3; 10 V/m 80 MHz - 1 GHz Level 4; 2 Kv I/O Level 3; 2 Kv power
- Fast transients (burst) EN 61000-4-4 Level 4; 2 Kv I/O Level 3; 2 Kv power
- RF conducted interference EN 61000-4-6 Level 3; 10 Vrms 150 KHz - 80 MHz
- Power frequency magnetic fields EN 61000-4-8 Level 4; 30 A/m
- Simulation of cordless telephone EN 55022 Level 3; 10 V/m 90 MHz ±5 MHz 200 Hz, 50% duty cycle

Emissions to EN 50081-2
- RF interference EN 55021 Enclosure class A Power mains class A

Note: Refer to the EMC Installation Guidelines for additional information.

14. ENVIRONMENTAL CONDITIONS:

Operating Temperature: 0 to 50°C
Storage Temperature: -40 to 70°C
Operating and Storage Humidity: 85% max.RH (non-condensing) from 0°C to 50°C.
Altitude: Up to 2000 meters

15. CONSTRUCTION: High impact plastic case with clear viewing window. The front panel meets NEMA 4X/IP65 requirements for indoor use when properly installed. Installation Category II, Pollution Degree 2. Panel gasket and mounting clips included.

16. WEIGHT: 1.5 lbs. (0.68 Kg).

PROGRAMMING

Programming the MDC unit is accomplished through the front panel keypad, which allows the user to enter into Main Menus, Sub-Menus, and Edit Menus. The English language prompts, the flashing parameter values, and the front panel keypad aid the operator during programming. In the normal run mode, the main display loop allows the user to scroll through the four programmable indication displays, using the direction keys. From the main loop, setpoints, alarm values and a gain value may be accessed directly for changes, without entering the programming loop. All other parameters are accessed through the programming loop, which can be set to require an access code number for loop entry. In the programming loop, parameters can be viewed or changed and the operator can exit anywhere in the loop.

INDICATION DISPLAY MODULE

PROGRAMMING MODULE

This document provided by Barr-Thorp Electric Co., Inc.  800-473-9123 www.barr-thorp.com
PROGRAMMABLE FUNCTIONS

MODES
- Master
- Follower

SCALING
- Pulses per Revolution Feedback (PPR FB) ranges from 1 to 99999
- Maximum RPM Feedback (MAX RPM FB) ranges from 1 to 99999
- Display Decimal Point (DSP DP) ranges from 0 to 0.0000
- Maximum Display Units (DSP UNIT) ranges from 1 to 99999
- Pulses per Revolution Lead (PPR LD) ranges from 1 to 99999
- Maximum RPM Lead (MAX RPM LD) ranges from 1 to 99999
*These parameters are available in Follower Mode only.

Note: Values may be programmed in the range listed, provided that the maximum equivalent frequency does not exceed 20.7kHz Hz. If this occurs, “OVFLW” will flash and a new entry will be required.

SETPOINTS
- 2 SPEED (Master Mode) - ranges from 0 to 99999 (or Display Unit Max.)
- 2 RAMP RATE (Master Mode) - ranges from 1 to 99999
- 2 RATIO (Follower Mode) - ranges from 0.0000 to 1.9999
- 2 RAMP RATE (Follower Mode) - ranges from 0.0001 to 1.9999 ratio units.
- 1 JOG SPEED - ranges from 0 to 99999 (or Display Unit Maximum).
- 1 JOG RAMP RATE - ranges from 1 to 99999.
- 2 ALARM - ranges from 0 to 99999.

Note: Values may be programmed in the range listed, provided that the maximum equivalent frequency does not exceed 20.7kHz Hz (20 KHz/sec for Ramp Rate). If this occurs, a message will flash and the maximum is automatically entered by the unit.

USER INPUTS
There are four programmable external user inputs and two programmable front panel function keys. The options for each user input are the same, except for the two function keys (F1/RUN & F2/STOP), which have additional options.

No Mode:
- If a user input terminal or a function key is activated, it will be ignored.

View Display 1-4:
Causes the selected indication display (1, 2, 3, or 4) to be displayed and held from anywhere in the main display loop.

Change Display:
Causes the indication display to toggle to the next indication display.

Reset Alarm(s) Output:
Places the alarm(s) output(s) in its inactive state.

Setpoint Select/Toggle:
Selects Setpoint 1 or Setpoint 2 for the active speed (or ratio) setpoint. This is a maintained select action for User Inputs 1 to 4, and a momentary toggle action for F1 or F2.

Ramp Select/Toggle:
Selects Ramp 1 or Ramp 2 for the active acceleration and deceleration ramp rate. This is a maintained select action for User Inputs 1 to 4, and a momentary toggle action for F1 or F2.

Ramp Override:
Overrides the acceleration/deceleration ramp routine causing the unit to jump to the ramp endpoint.

Setpoint Increment:
Only an external User Input can be used for this option. The currently active speed or ratio setpoint is incremented when the User Input is made active. If the input remains active for more than 5 display unit increments, the scroll rate will progressively increase.

Setpoint Decrement:
Only an external User Input can be used for this option. The currently active speed or ratio setpoint is decremented when the User Input is made active. If the input remains active for more than 5 display unit increments, the scroll rate will progressively increase.

Program Disable:
Only an external user input can be used for this option. When used with the program disable DIP switch, this option can limit operator access to programmable parameters.

Run (F1 only):
Pressing the F1 button causes the MDC to accelerate the motor from Stop mode to the active speed setpoint using the active ramp rate.

R-Stop (F1 or F2 only):
Pressing the function key programmed for R-Stop causes the unit to decelerate the motor from its active speed to Stop mode using the active ramp rate.

F-Stop (F1 or F2 only):
Pressing the function key programmed for F-Stop causes the unit to execute a fast stop, taking the motor from its current speed immediately to the stop mode. The deceleration is limited only by the motor and drive.

Jog (F1 or F2 only):
This function is only available from the Stop mode. Pressing and holding the function key programmed for Jog causes the unit to accelerate the motor to the jog speed setpoint using the jog ramp rate.

ALARMS
Type Of Alarm:
- High Alarm: Alarm output activates when the feedback input is greater than or equal to the alarm value.
- Low Alarm: Alarm output activates when the feedback input is less than or equal to the alarm value.
- Deviation Alarm: The alarm output activates when the feedback input is outside a ± band.
- Zero Speed Alarm: Alarm output activates when the feedback input receives no input pulse for at least one second.
- Disabled: The alarm output is inactive when disabled.

Phase:
Each output can have its active logic state set for Positive phase (ON) or Negative phase (OFF).

Latched Or Boundary:
An alarm programmed for a latched output stays active until it is manually reset by a User Input. An alarm programmed for boundary output stays active as long as the alarm condition exists, after which the output returns to its inactive state.

Fast Or Normal Update:
The normal update rate for the alarm outputs is once each second. The fast update rate occurs at an interval less than or equal to 40 mSec.

INDICATION DISPLAYS
If an indication display is to show two different numeric values, one for each line, there will be a single or dual character mnemonic to the left of the numeric value. Each line of each indication display can be programmed to show mnemonics or a numeric value. The following list shows the single or dual character mnemonics that will be displayed when value is selected and the mnemonics for each programmable option.

<table>
<thead>
<tr>
<th>VAL</th>
<th>MNE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 99999</td>
<td>SETPT. 1</td>
<td>Speed or ratio setpoint 1</td>
</tr>
<tr>
<td>S2 99999</td>
<td>SETPT. 2</td>
<td>Speed or ratio setpoint 2</td>
</tr>
<tr>
<td>Sp 99999</td>
<td>SPEED</td>
<td>Actual speed in user display units (feedback)</td>
</tr>
<tr>
<td>R 1999</td>
<td>RATIO</td>
<td>Actual ratio (follower mode)</td>
</tr>
<tr>
<td>%D 100.0</td>
<td>% DEV.</td>
<td>% deviation of actual speed from target speed</td>
</tr>
<tr>
<td>%C 100.0</td>
<td>% OUTPUT</td>
<td>Analog drive output; % of full scale voltage</td>
</tr>
<tr>
<td>PB 20971</td>
<td>PB_FREG</td>
<td>Feedback frequency in pulses/sec (Hz)</td>
</tr>
<tr>
<td>LD 12000</td>
<td>LD_FREG</td>
<td>Lead frequency in pulses/sec (Hz)</td>
</tr>
<tr>
<td>A1 99999</td>
<td>ALARM 1</td>
<td>Alarm 1 setpoint</td>
</tr>
<tr>
<td>A2 99999</td>
<td>ALARM 2</td>
<td>Alarm 2 setpoint</td>
</tr>
<tr>
<td>Tr 4095</td>
<td>TRIM</td>
<td>Error correction in bits (-4095 to +4095)</td>
</tr>
</tbody>
</table>

STATUS DISPLAYS
Operating Status:
- Setpoint 1, ramp rate 1, Stop mode
- Alarm 1 active, alarm 2 inactive

Operating Status:
The operating status display indicates the currently active speed or ratio setpoint (S1 or S2), the currently active ramp rate (R1 or R2), and the mode of operation (RUN, STOP, or JOG). An arrow will replace the “R” for the currently active ramp rate indication when an actual ramp up or down is in progress.

Alarm Status:
The alarm status display indicates that an alarm output is active when the corresponding output number (1 or 2) is displayed. When an alarm output is inactive, a dash is displayed.
OPERATOR ACCESS

This is used with the program disable DIP switch or an external user input that is selected for the program disable function. When a setpoint is selected as NO, it can be viewed, but NOT changed from the front panel keypad. The following setpoint values can be disabled from front panel access programming:

<table>
<thead>
<tr>
<th>Speed/Ratio Setpoint 1 and 2</th>
<th>Jog Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp Rate 1 and 2</td>
<td>Jog Ramp</td>
</tr>
<tr>
<td>Alarm Setpoint 1 and 2</td>
<td>Gain</td>
</tr>
<tr>
<td>Setpoint Scroll Menu</td>
<td></td>
</tr>
</tbody>
</table>

USER SETTINGS

The operator can reset ALL parameters to the factory settings if desired.

PROGRAM DIAGNOSTICS

This allows testing of the various MDC inputs and outputs. It is especially useful after unit installation to independently test the operation of external switches, relays, the feedback transducer, and the motor drive system.

Inputs - The MDC displays an alphanumeric character to indicate a Dedicated Function Input or a User Input is active. This allows the user to check switch operation and wiring connections to the Inputs.

Alarm Outputs - The up and down arrow keys are used to select an alarm output and set it to the active or inactive state. This allows the user to check the operation of devices wired to the alarm outputs and the wiring connections.

Drive Output - This function allows the user to test the Drive System. A % Output value is entered through the front panel keypad causing the motor to run at the corresponding open loop speed. The display indicates the motor’s feedback frequency.

PROGRAM SECURITY

The programmable code number is used in conjunction with the program disable DIP switch and/or a user input programmed for the program disable function to limit operator access to programming.

FOLLOWER MODE APPLICATION

A fertilizer production facility is mixing pellets containing Nitrogen with pellets that contain Phosphorus. A chemical ratio of 1:1 is determined by the speed of two different conveyors. Because of differences in the gearing of the conveyor and concentration of the pellets, the Nitrogen conveyor motor must run at 3 times the speed of the Phosphorus conveyor motor in order to produce a 1:1 mixture. The maximum speed of both motors is 2000 RPM. Set the follower MDC scaling to produce a 1:1 mixture of Nitrogen and Phosphorus when a setpoint of 1.0000 is entered. Display speed units are in RPM’s. Both the lead and feedback frequency are taken from 60 tooth gears on each motor shaft.

1) Choose the Phosphorus conveyor motor for the follower MDC. It runs slower than the Nitrogen conveyor motor.
2) Set the Pulses per revolution feedback to 60.
3) Set the MAX RPM feedback to 2000. This is the conveyor motor’s maximum operating speed.
4) Set display decimal point to 0.
5) Set display unit to 2000. The display speed unit maximum is 2000 at a MAX RPM FB of 2000. If the display units wanted were conveyor feet/minute or Phosphorus pellets in lbs/sec, the equivalent display value for 2000 RPM would be entered.
6) Set the pulses per revolution lead to 60.
7) Setting the MAX RPM Lead:

This is the Lead RPM that would be necessary to have a 1:1 mixture if the Follower Speed was MAX RPM FB (2000 RPM). Since the Nitrogen conveyor motor must run 3 times as fast as the Phosphorus motor, MAX RPM LD = 3 * 2000 = 6000 RPM. Set MAX RPM LD = 6000 RPM. This is the correct value, even though the Nitrogen conveyor motor would never actually run at 6000 RPM. A ratio setpoint of 1.0000 on the MDC is now equal to a 1:1 mixture of Phosphorus and Nitrogen.

MASTER MODE APPLICATION

A pump delivers a maximum of 30.0 gallons per minute with a shaft speed of 1750 RPM. A shaft pulse encoder generates 60 pulses/revolution. Set the MDC scaling to control and display pumping speed in tenths of a gallon/minute. In the Program Scaling Module:

1) Set the pulses per revolution feedback to 60.
2) Set the maximum RPM feedback to 1750. This is the pump shaft’s maximum operating speed.
3) Set display decimal point to 0.0. Display units are in 0.1 gpm.
4) Set max display units to 30.0. The display speed unit maximum is 30.0 at a MAX RPM FB of 1750.

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDC</td>
<td>Motor Drive Controller with Red Backlighting</td>
<td>MDC00100</td>
</tr>
</tbody>
</table>
MODELS HHT & HHTP - ACCURATE 5-DIGIT PRECISION MEASURING HAND HELD TACHOMETERS

- MICRO-COMPUTER CIRCUITRY
  The exclusive one chip Micro-computer LSI-circuit and crystal time base is used to accurately provide a wide measurement range.

- MEMORY
  The last maximum/minimum reading will be automatically stored in memory and can be displayed by pressing the “MEMORY” switch.

- ERROR-FREE READING
  Highly visible LCD display, with Leading Zero Blanking gives exact RPM with no guessing or errors and saves battery energy.

- RUGGED AND LIGHTWEIGHT CONSTRUCTION
  The use of durable, long-lasting components, including a strong, lightweight ABS-plastic housing assures maintenance-free performance for many years. The housing has been carefully shaped to fit comfortably in either hand.

- BATTERIES INCLUDED

DESCRIPTION
The CONTACT TACHOMETER (Model HHT) incorporates precision bearings instead of gears to ensure long life while providing minimal loading to the rotating shaft. A built-in photo-sensor and slotted disc detect the number of revolutions for a high degree of accuracy. By simply pressing the “MEASURE” button and lightly contacting the conical tip against the center hole of a rotating shaft, the RPM will be displayed and updated every second. By attaching the circumferential speed wheel (included), the Model HHT can measure surface speed in “Switch Selectable” units of either feet per minute (FT/MIN) or meters per minute (M/MIN).

The PHOTO TACHOMETER (Model HHTP) provides for non-contact RPM measurements which enhances operator safety when measuring high speed shafts. By pressing the “MEASURE” button and aiming the Visible Light Beam at a piece of reflective tape (included) on the rotating shaft, RPM will be displayed and updated every second. A display indicator blinks once each revolution to ensure that the reflecting mark is within the 2” to 12” sensing distance of the Model HHTP.

Both units can display Memory values which are obtained immediately before turning off the “MEASURE” button. The last value, Maximum value and Minimum value can be displayed by pressing the “MEMORY” button as follows:

1. First Push and Hold = Last value displayed:
   “LA” and last value alternately displayed.
2. Second Push and Hold = Maximum value displayed:
   “UP” and maximum value alternately displayed.
3. Third Push and Hold = Minimum value displayed:
   “DN” and minimum value alternately displayed.

These memory features are useful when the measurement to be made is in a “hard-to-access” area where the display is not visible to the operator. A “LO” (low battery) display is incorporated in both units and is a visible reminder when batteries are to be replaced.

BATTERY REPLACEMENT
A) When it is necessary to replace the batteries (battery voltage less than approx. 4.5 V), “LO” will appear in the display.
B) Slide the battery cover away from the instrument and remove the batteries.
C) Install new batteries correctly into the case. Permanent damage to the tachometer circuit may result from incorrect installation.

CONTACT TACHOMETER SPECIFICATIONS
1. MEASUREMENT RANGE:
   0.5 to 8,000 RPM
   0.05 to 1999.9 m/min.
   0.2 to 6560 ft/min.

2. RESOLUTION:
   0.1 RPM (0.5 to 999.9 RPM)
   1 RPM (over 1000 RPM)
   0.01 m/min. (0.05 to 999.9 m/min.)
   0.1 m/min. (over 1000 m/min.)
   0.1 ft/min. (0.1 to 999.9 ft/min.)
   1 ft/min. (over 1000 ft/min.)

3. ACCURACY:
   ±0.05% full scale + 1 digit

4. SAMPLE TIME: 1 sec. (over 6 RPM)

5. POWER CONSUMPTION: Approximately 10 mA.

6. ACCESSORIES INCLUDED: RPM adapters (1 cone, 1 funnel), Surface speed test wheel, Carrying Case, Instruction Manual.

7. WEIGHT:
   0.58 lb. (260 g) including battery

PHOTO TACHOMETER SPECIFICATIONS
1. MEASUREMENT RANGE: 5 to 99,999 RPM (one reflecting mark)

2. RESOLUTION: 0.1 RPM (0.5 to 999.9 RPM)
   1 RPM (over 1000 RPM)

3. ACCURACY:
   ±0.05% full scale + 1 digit

4. SAMPLING TIME: 1 sec. (over 60 RPM)

5. DETECTING DISTANCE: (2-6 inches) (50 to 150 mm) Typical max. 12 inches (300 mm) depending upon ambient light.

6. POWER CONSUMPTION: Approximately 150 mA (Operation).
   Approximately 20 mA (Memory Recall)

7. ACCESSORIES INCLUDED: Carrying Case, 23.6 inches (600 mm) Reflective tape, Instruction Manual.

8. WEIGHT:
   0.55 lb. (250 g) including battery

COMMON SPECIFICATIONS
1. DISPLAY: 5-digit, 0.4” high LCD.

2. MEMORY TIME: 10 sec. nominal.

3. TIME BASE: Quartz crystal.

4. BATTERY: 4 x 1.5 V AA size.

5. OPERATING TEMPERATURE: 32°F to 120°F (0°C to 50°C).

6. SIZE: 6.7” x 2.8” x 1.5” (170 mm x 72 mm x 37 mm)

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHT</td>
<td>LCD Hand Held Contact Tachometer</td>
<td>HHT00000</td>
</tr>
<tr>
<td>HHTP</td>
<td>LCD Hand Held Photo Tachometer</td>
<td>HHTP00000</td>
</tr>
<tr>
<td></td>
<td>Replacement 1/2” x 2” Reflective Tape For HHTP</td>
<td>HHTK00000</td>
</tr>
<tr>
<td></td>
<td>HHT Rubber Wheel</td>
<td>HHTWHL00</td>
</tr>
<tr>
<td></td>
<td>HHT Cone Point Disc With Shaft</td>
<td>HHTCONE0</td>
</tr>
<tr>
<td></td>
<td>HHT Concave Disc</td>
<td>HHTCONEC0</td>
</tr>
</tbody>
</table>

1-717-767-6511