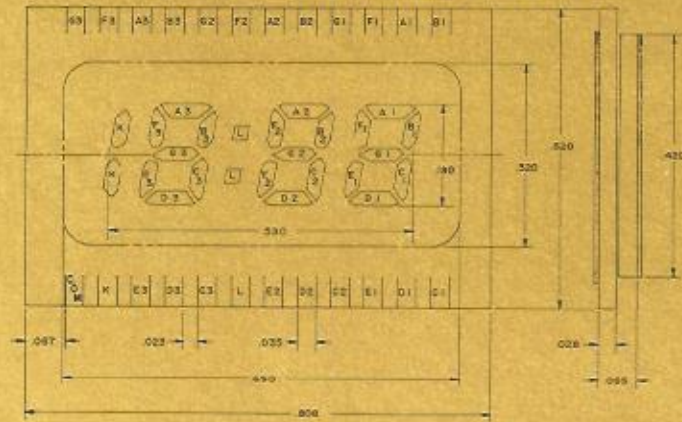




## OPTEL WATCH DISPLAY 1101



All specifications at 25°C unless noted

**Description:**

The model 1101 is a low power, field effect, liquid crystal display. The elegant seven segment font produces dark numbers on a light background.

**Power Consumption:**

2.5u watts, maximum power with all segments on. 25°C and 10 Volts peak to peak input.

**Operating Voltage Range:**

4 to 15 Volts AC square wave.  
3 Volt operation also available.

**Operating Frequency:**

32 Hertz.

**Response Time:**

Less than 50 millisecond rise time.  
Less than 150 millisecond fall time.

**Segment Resistance:**

Greater than 100 megohms.

**Segment Capacitance:**

Less than 10 pf.

**Operating Temperature:**

0°C to +55°C.

**Storage Temperature:**

-20°C to +60°C.

Note: If stored at -10°C for longer than 24 hours, display must be maintained at +60°C for 5 minutes to restore maximum contrast.

**Life:**

Greater than 30,000 hours.

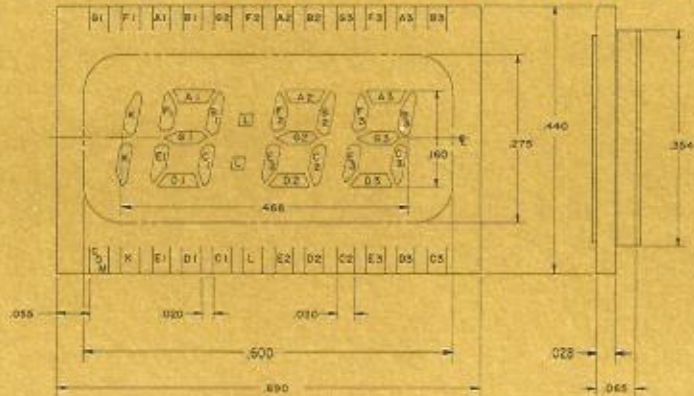
**Custom Capability:**

Variations of standard designs are readily available on a custom basis.

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## OPTEL WATCH DISPLAY 2105



All specifications at 25°C unless noted

**Description:**

The model 2105 is a low power, field effect, liquid crystal display. The elegant seven segment font produces dark numbers on a light background.

**Power Consumption:**

2.5u watts, maximum power with all segments on. 25°C and 10 Volts peak to peak input.

**Operating Voltage Range:**

4 to 15 Volts AC square wave.  
3 Volt operation also available.

**Operating Frequency:**

32 Hertz.

**Response Time:**

Less than 50 millisecond rise time.  
Less than 150 millisecond fall time.

**Segment Resistance:**

Greater than 100 megohms.

**Segment Capacitance:**

Less than 10 pf.

**Operating Temperature:**

0°C to +55°C.

**Storage Temperature:**

-20°C to +60°C.

Note: If stored at -10°C for longer than 24 hours, display must be maintained at +60°C for 5 minutes to restore maximum contrast.

**Life:**

Greater than 30,000 hours.

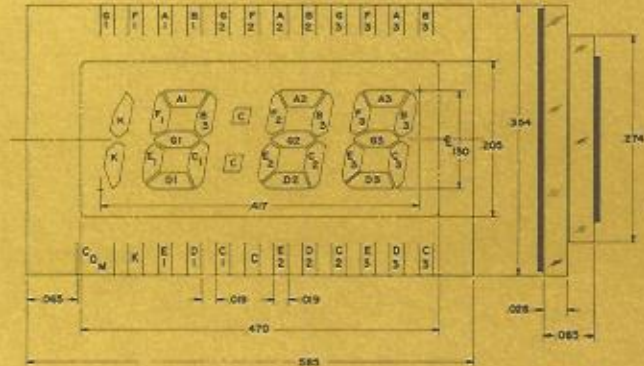
**Custom Capability:**

Variations of standard designs are readily available on a custom basis.

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## OPTEL WATCH DISPLAY 2109



All specifications at 25°C unless noted

**Description:**

The model 2109 is a low power, field effect, liquid crystal display. The elegant seven segment font produces dark numbers on a light background.

**Power Consumption:**

2.5u watts, maximum power with all segments on. 25°C and 10 Volts peak to peak input.

**Operating Voltage Range:**

4 to 15 Volts AC square wave.  
3 Volt operation also available.

**Operating Frequency:**

32 Hertz.

**Response Time:**

Less than 50 millisecond rise time.  
Less than 150 millisecond fall time.

**Segment Resistance:**

Greater than 100 megohms.

**Segment Capacitance:**

Less than 10 pf.

**Operating Temperature:**

0°C to +55°C.

**Storage Temperature:**

-20°C to +60°C.

Note: If stored at -10°C for longer than 24 hours, display must be maintained at +60°C for 5 minutes to restore maximum contrast.

**Life:**

Greater than 30,000 hours.

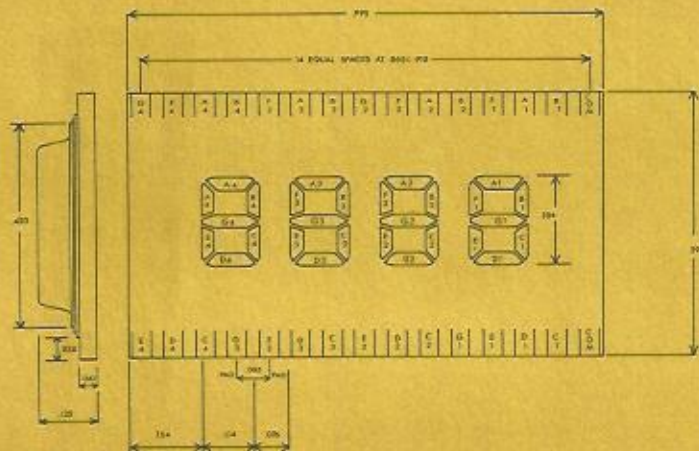
**Custom Capability:**

Variations of standard designs are readily available on a custom basis.





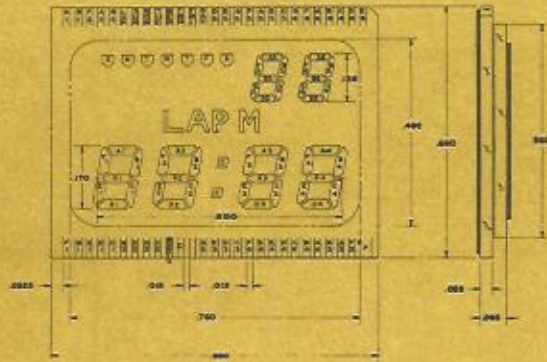
## OPTEL 4 DIGIT NUMERIC DISPLAY 4073



POWER CONSUMPTION	55 microwatt maximum power with all segments on. 25°C and 30 volts peak to peak input.
OPERATING VOLTAGE RANGE	30 to 40 volts peak to peak square wave. No DC component.
OPERATING FREQUENCY	32 Hertz
RESPONSE TIME	Less than 50 millisecond rise time @ 25°C Less than 200 millisecond fall time @ 25°C
SEGMENT RESISTANCE	Greater than 100 megohms at 25°C
SEGMENT CAPACITANCE	Less than 6 picofarads at 25°C
OPERATING TEMPERATURE	10°C to 50°C
STORAGE TEMPERATURE	-20°C to 70°C
CONTRAST RATIO	Greater than 10:1
VIBRATION	No damage after 30 minutes of simple harmonic vibration 0.60 inches peak to peak amplitude. Frequency varied uniformly between 10 to 55 Hertz in three mutually perpendicular directions.
LIFE	Greater than 10,000 hours



## OPTEL WATCH DISPLAY 4104



All specifications at 25°C unless noted

**Description:**

The model 4104 is a low power, field effect, liquid crystal display. The elegant seven segment font produces dark numbers on a light background.

**Power Consumption:**

2.5u watts, maximum power with all segments on. 25°C and 10 Volts peak to peak input.

**Operating Voltage Range:**

4 to 15 Volts AC square wave.  
3 Volt operation also available.

**Operating Frequency:**

32 Hertz.

**Response Time:**

Less than 50 millisecond rise time.  
Less than 150 millisecond fall time.

**Segment Resistance:**

Greater than 100 megohms.

**Segment Capacitance:**

Less than 10 pf.

**Operating Temperature:**

0°C to +55°C.

**Storage Temperature:**

-20°C to +60°C.

Note: If stored at -10°C for longer than 24 hours, display must be maintained at +60°C for 5 minutes to restore maximum contrast.

**Life:**

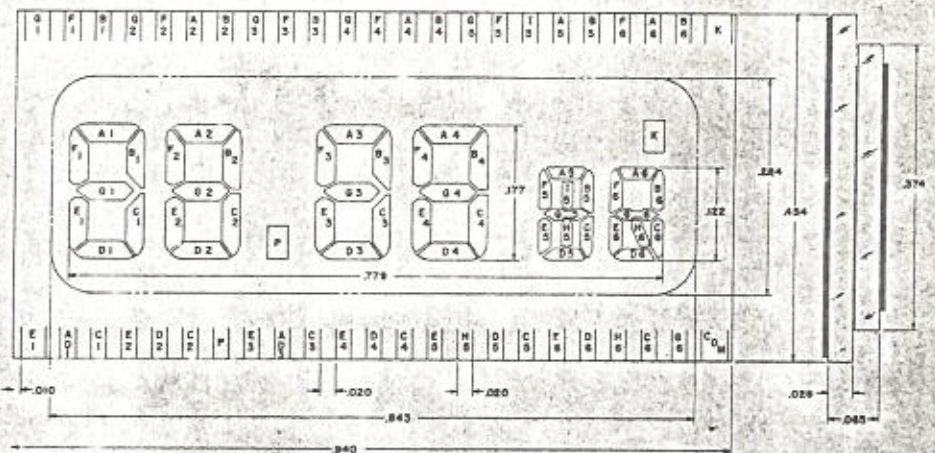
Greater than 30,000 hours.

**Custom Capability:**

Variations of standard designs are readily available on a custom basis.



## OPTTEL WATCH DISPLAY 4110

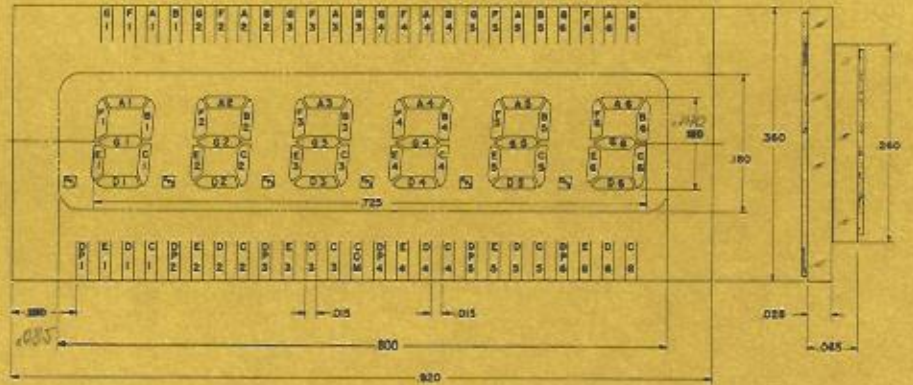


All specifications at 25°C unless noted

Description:	The model 4110 is a low power, field effect, liquid crystal display. The elegant seven segment font produces dark numbers on a light background.
Power Consumption:	2.5u watts, maximum power with all segments on. 25°C and 10 Volts peak to peak input.
Operating Voltage Range:	4 to 15 Volts AC square wave. 3 Volt operation also available.
Operating Frequency:	32 Hertz.
Response Time:	Less than 50 millisecond rise time. Less than 150 millisecond fall time.
Segment Resistance:	Greater than 100 megohms.
Segment Capacitance:	Less than 10 pf.
Operating Temperature:	0°C to +55°C.
Storage Temperature:	-20°C to +60°C.  Note: If stored at -10°C for longer than 24 hours, display must be maintained at +60°C for 5 minutes to restore maximum contrast.
Life:	Greater than 30,000 hours.
Custom Capability:	Variations of standard designs are readily available on a custom basis.



## OPTEL WATCH DISPLAY 4112



### Description:

All specifications at 25°C unless noted

The model 4112 is a low power, field effect, liquid crystal display. The elegant seven segment font produces dark numbers on a light background.

### Power Consumption:

2.5u watts, maximum power with all segments on. 25°C and 10 Volts peak to peak input.

### Operating Voltage Range:

4 to 15 Volts AC square wave.  
3 Volt operation also available.

### Operating Frequency:

32 Hertz.

### Response Time:

Less than 50 millisecond rise time.  
Less than 150 millisecond fall time.

### Segment Resistance:

Greater than 100 megohms.

### Segment Capacitance:

Less than 10 pf.

### Operating Temperature:

0°C to +55°C.

### Storage Temperature:

-20°C to +60°C.

Note: If stored at -10°C for longer than 24 hours, display must be maintained at +60°C for 5 minutes to restore maximum contrast.

### Life:

Greater than 30,000 hours.

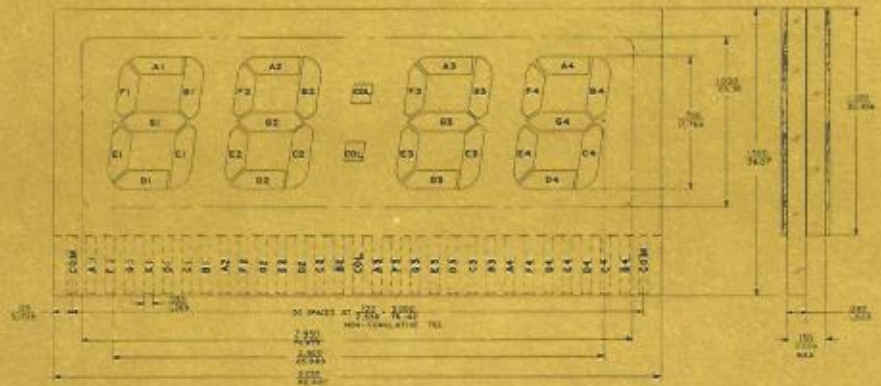
### Custom Capability:

Variations of standard designs are readily available on a custom basis.





## OPTEL CLOCK DISPLAY 6300



### Description:

All specifications at 25°C unless noted

The model 6300 is a low power, field effect, liquid crystal display. The elegant seven segment font produces dark numbers on a light background.

### Power Consumption:

50u watts, maximum power with all segments on. 25°C and 5 Volts XXXXXXXXXX input.

### Operating Voltage Range:

4 to 15 Volts AC square wave.  
3 Volt operation also available.

### Operating Frequency:

32 Hertz typ - 30 Hz min. - 100 Hz max.

### Response Time:

Less than 50 millisecond rise time.  
Less than 150 millisecond fall time.

### Segment Resistance:

Greater than 100 megohms.

### Segment Capacitance:

Less than 100 pf.

### Operating Temperature:

0°C to +55°C.

### Storage Temperature:

-20°C to +60°C.

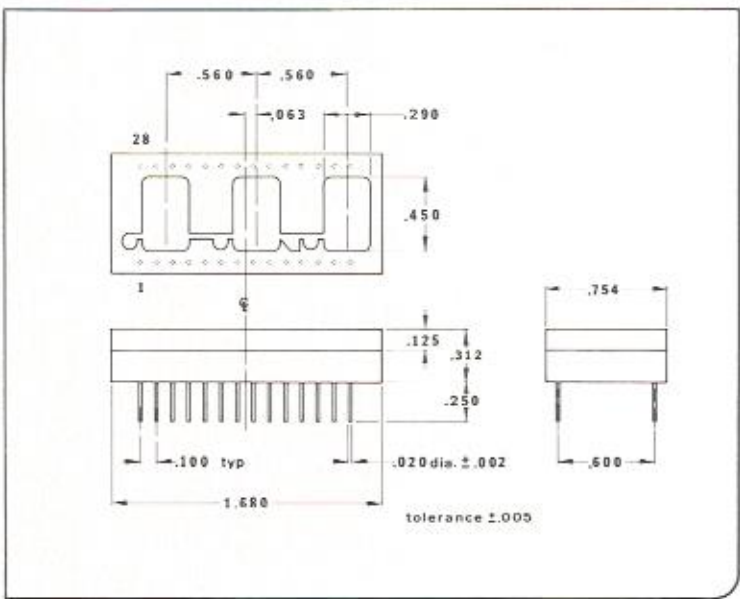
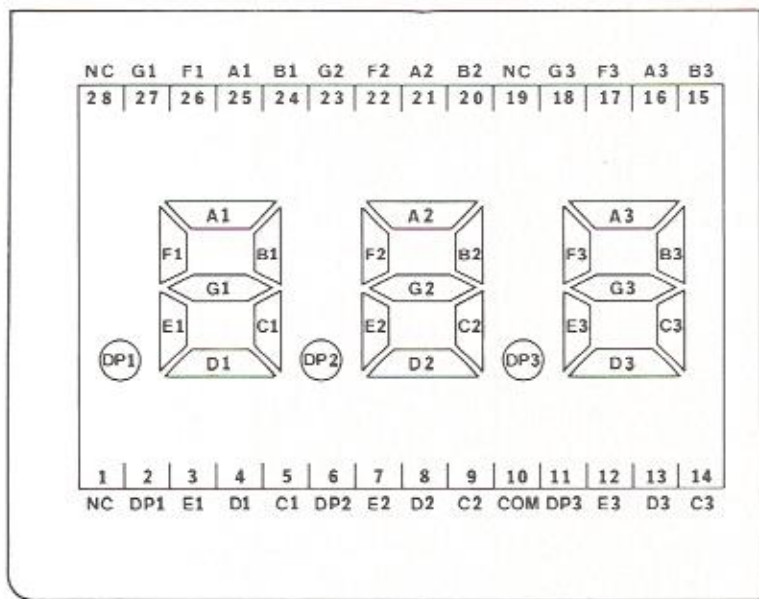
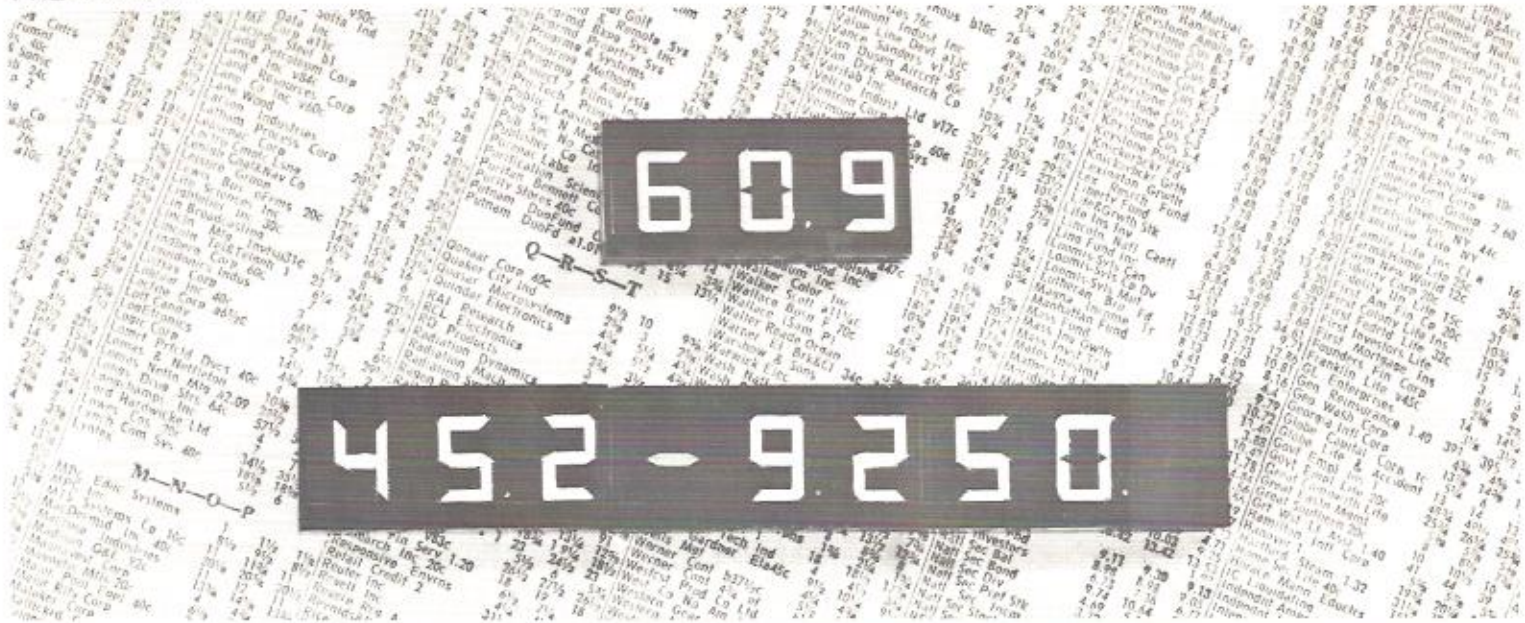
Note: If stored at -10°C for longer than 24 hours, display must be maintained at +60°C for 5 minutes to restore maximum contrast.

### Life:

Greater than 30,000 hours.

### Custom Capability:

Variations of standard designs are readily available on a custom basis including glass thickness changes.



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**OPTEL 1003 LIQUID CRYSTAL DISPLAY**

The display consists of a thin layer of normally transparent liquid crystal material between two electrodes. When an electric field is applied, the material becomes turbulent, reflecting and scattering ambient light. This display is reflective. It maintains excellent brightness and contrast under high ambient light conditions while requiring extremely low power. Applications include digital counters, test instruments, calculators, clocks, panel meters, and other indicators.

## OPTEL MODEL 1003 REFLECTIVE LIQUID CRYSTAL DISPLAY

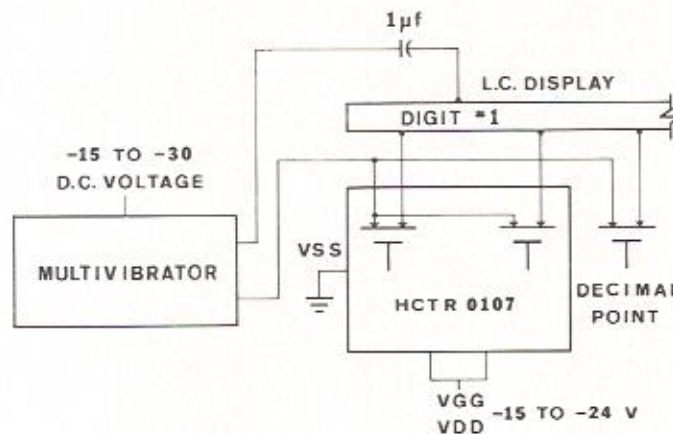
Optel Model 1003 liquid crystal display is a 3 digit, 3 decimal point unit designed to butt to adjacent displays to make arrays of three, six, nine or more digits. The package is a dual inline 28 pin IC package with 0.600 inch pin row spacing and 0.100 inch pin centers. The display is in a single plane, which permits a wide viewing angle.

### CHARACTERISTICS (25°C case temperature)

Operating voltage	15 to 60 volts (1) (2)
Power requirements	40 microwatts per segment at 20 volts.
Rise Time	15 to 20 milliseconds typical.
Decay time	100 to 200 milliseconds typical
Life	10,000 hours (1)
Relative humidity	0 to 100%
Operating temperature	10 to 50°C
Storage temperature	0 to 80°C
Brightness and contrast	Directly a function of ambient light.

Notes: (1) For extended life, 10,000 hours or greater, displays must be operated in AC mode, 20 to 100 Hz.

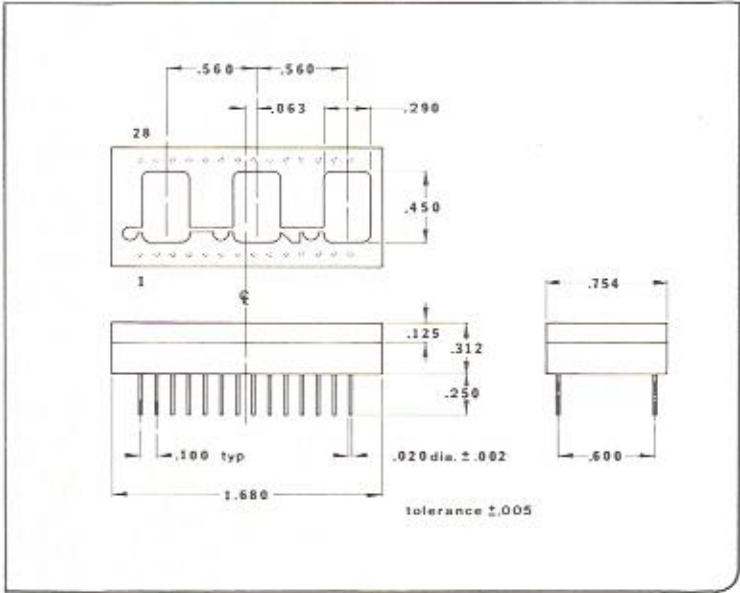
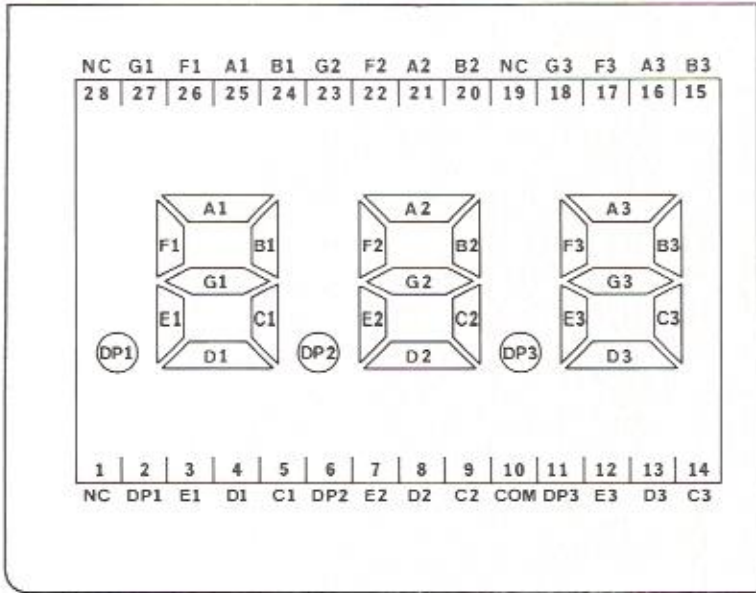
(2) The Hughes HCTR 0107 Universal Counter Display Driver is directly compatible with the Optel display, as shown below:





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Rise Time	15 to 20 milliseconds typical.
Decay time	100 to 200 milliseconds typical
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Relative humidity	0 to 100%
Operating temperature	10 to 50°C
Storage temperature	0 to 80°C
Brightness and contrast	Directly a function of ambient light.

Notes: (1) For extended life, 10,000 hours or greater, displays must be operated in AC mode, 20 to 100 Hz.

(2) The Hughes HCTR 0107 Universal Counter Display Driver is directly compatible with the Optel display, as shown below:

