# ENTHONE® 50-SERIES CAT-L-INK

## Legend Ink

**DESCRIPTION**

50-Series Cat-L-Inks are permanent, two component, epoxy-based screen printing inks. They may be used with a selection of catalysts which cure at elevated and/or room temperatures. When properly applied and cured, Cat-L-Inks have excellent adhesion to photoimageable, thermal and UV solder masks, glass, metal and plastic. They have excellent chemical and thermal resistance properties.

50-Series Cat-L-Inks are used in the electronic, aerospace, automotive, appliance and decorative container industries. Uses include the permanent marking of circuit boards, semiconductor components, connectors, dials, nameplates, edge-lit panels, chassis, glass and thermoplastics.

**COLOR NUMBERS AND MIX RATIOS**

| Ink Number | Color | Recommended Catalyst | Mix Ratios<br>Catalyst Additions<br>Parts by Weight per 100 Parts Ink | |
|---|---|---|---|---|
| | | | All Catalysts (except Catalyst 5) | Catalyst 5 Only |
| 50-100R | White | * | 6.0 | 8.5 |
| 50-110RX | White, Matte | 9 | 5.0 | NR |
| 50-120R | Hi-Hide White | * | 4.5 | 7.0 |
| 50-200AR | Primrose Yellow (Cadmium) | * | 6.0 | 8.5 |
| 50-201AR | Lemon Yellow (Cadmium) | * | 6.0 | 8.5 |
| 50-202BC | Yellow, Bar Code (Chromium) [1] | * | 6.0 | 8.5 |
| 50-202BR | Medium Yellow (Chromium) | * | 6.0 | 8.5 |
| 50-206R | Orange | * | 6.0 | 8.5 |
| 50-300R | Emerald Green [4] | * | 6.0 | 8.5 |
| 50-301R | Deep Green | * | 7.0 | 9.5 |
| 50-400R | Ultramarine Blue | * | 6.5 | 9.0 |
| 50-403R | Light Blue [4] | * | 6.0 | 8.5 |
| 50-407R | Medium Blue [4] | * | 7.5 | 10.0 |
| 50-506BR | Deep Red (Chromium) | * | 6.0 | 8.5 |
| 50-507R | Medium Red (Cadmium) | * | 6.0 | 8.5 |
| 50-508R | Medium Red (Chromium) | * | 6.5 | 9.0 |
| 50-600R | Chocolate Brown [4] | * | 7.0 | 9.5 |
| 50-700R | Black | * | 7.0 | 9.5 |
| 50-710R | Black, Matte [2] | * | 4.0 | NR |
| 50-770R | Black, Matte (Nonconductive) [3] | B-13/28 | 6.5 | NR |
| 50-771R | Black, Gloss (Nonconductive) [3] | * | 6.0 | 8.5 |
| 50-800R | Clear, Gloss | * | 9.0 | 11.5 |
| 50-810R | Clear, Matte | * | 6.0 | 8.5 |

[1] For laser marking
[2] Not intended for electrical applications
[3] Intended for electrical applications
[4] Available as color match only

*Use any catalyst listed on Page 2



Issued: 8/00
Revised 7/01

## CATALYST DESCRIPTION

| Catalyst | Description | Cure | Average Pot Life* (hours) |
|---|---|---|---|
| 20/A | Basic air cure catalyst. Cures at room temperature in 5-7 days. Tack free after 1-2 hours. May also be heat cured. | *R.T. or Heat | 2 |
| B-3 | Basic heat cure only catalyst. Higher cure temperatures decrease cure time. | Heat | 4 |
| 5 | Long pot life. Excellent adhesion properties. Special mix ratios are required for this heat cure only catalyst (refer to Section 2.0). | Heat | 24 + |
| 9 | Basic heat cure only catalyst with good anti-yellowing resistance. (Recommended for use with 50-110RX). | Heat | 7 |
| B-13/28 | Accelerated air cure catalyst. Cures at room temperature in 3 days. Shorter pot life. | *R.T. or Heat | 1 |
| 45 | Long pot life. This heat cure only catalyst contains adhesion promoters. Provides excellent adhesion to glass and metals with good water resistance. Slightly decreases solvent resistance. | Heat | 12 |
| 77 | Adhesion promoting catalyst. Cures at room temperature in 5-7 days. Provides similar characteristics as Catalyst 45. Maximum adhesion is achieved by heat cure @ 65.6-93.3 $^{o}$C (150-200$^{o}$F). | *R.T. or Heat | 1 |

* @ 21°C (70°F)

## MIXING INSTRUCTIONS

Measure ink and catalyst at the proper mix ratio (refer to Page 1). Both the ink and catalyst should be weighed accurately. Excessive and insufficient amounts of catalyst are detrimental to cured ink film properties.
Mix thoroughly without introducing excessive amounts of air. Avoid the use of paper or wax coated cups. Stir from bottom of the container
OBSERVE INDUCTION PERIOD
All catalysts: 30 minutes
Catalysts 45 and 5: 60 minutes
Allow ink/catalyst mixture to stand for at least 30 minutes prior to application. This provides an induction period ensuring a homogenous mix of resin and catalyst and allows any entrapped air to escape from the mixture. The average pot life begins after the induction period
APPLICATION
50-000 Series inks may be applied by screen printing, spraying, brushing and roller printing. To ensure optimum adhesion, it is imperative that the surface to be printed is clean and free of any residues or particulates.

## OPTIONAL ADDITIONS

Additions of thinner or flow agents should always follow the induction period. If the induction period is not observed, the thinner or flow agent may interfere with the catalyzation process and could effect the final cured properties.



Issued: 8/00
Revised 7/01

## POT LIFE

Pot life will vary with the catalyst used (refer to Page 2). To avoid waste, mix only an amount which can be consumed before the end of the pot life. High ambient temperatures will shorten the pot life. Solvent additions will increase the pot life.
If an exceptionally long pot life is required (24+ hours), heat cure only Catalyst 5 is available through special order.

## SHELF LIFE

50-Series Inks: 3 years from date of manufacture
All Catalysts: 2 years from date of manufacture

NOTE: Catalysts are hygroscopic. Containers should be kept tightly closed after each use to prevent moisture contamination.

## SCREEN PRINTING

FABRIC
Monofilament polyester or metallized polyester fabrics with a mesh count from 180 to 350 are recommended. Equivalent stainless steel fabrics may also be used. Mesh tension should be to fabric manufacturer's recommendations.

SQUEEGEE MATERIAL
Squeegees should be between 60-80 durometer, sharp and free of nicks. Squeegee durometer, pressure, angle and print speed should be adjusted according to the overall printing parameters to ensure consistent print definition and ink film thickness.

STENCIL MATERIAL
Any lacquer resistant Direct, Indirect, Direct/Indirect or Capillary Stencil system.

THINNING
If thinning is required, add small amounts of AD2001 or butyl cellosolve acetate. Additions should be made after the induction period. Thinner additions extend the pot life.

RETARDING
Small amounts of AD2003 or carbitol acetate are recommended. Additions should only be made after the induction period has been observed.

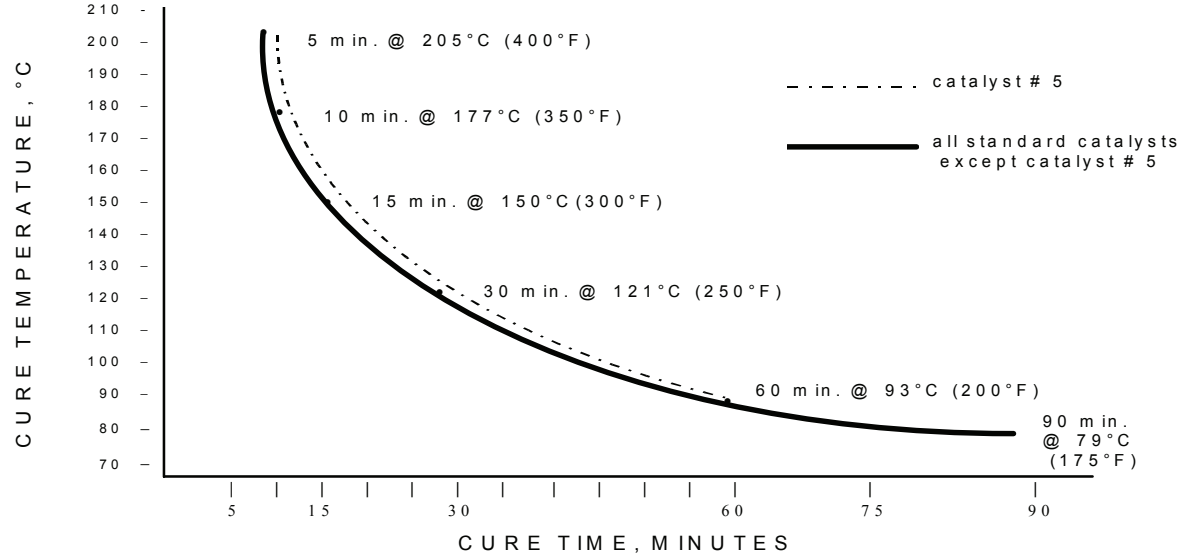
SPRAYING
Following the induction period, thin with AD2002 or a blend of 80% PM glycol ether and 20% methyl isobutyl ketone at 25-50% by volume, depending on air pressure and orifice of spray unit. Thinner additions will extend the pot life considerably.

REMOVAL
Enthone SC1710 screen cleaner, AD2003 or any lacquer wash will effectively clean screens and equipment before the ink cures.


Issued: 8/00
Revised 7/01

## RECOMMENDED CURE

CURE SCHEDULE




## ADDITIONAL CURE INFORMATION

Cure schedules denote times/temperatures for curing ink film only. Allow additional time for the substrate to reach the actual cure temperature. Convection ovens should have sufficient exhaust and air movement to ensure solvent removal.
Cure temperatures above 79 °C (175 °F) are recommended for Catalysts 9 or 45.
Cure temperatures above 93°C (200°F) are required for Catalyst 5.
Catalyst B-3 may be fully cured at 55◦C (130◦F) for 3 hours.

Air cure Catalysts 20/A, B-13/28 and 77 provide a tack-free ink surface after 1-1.5 hours, depending on the ink film thickness. A tack-free surface is not always an indicator of cure.
When using an ambient cure, articles should be racked and/or spaced to allow air circulation for the designated cure schedule. Do not box, bag or package until the recommended cure time has been observed. Hot air blasts can be used to expedite handling. These catalysts may be fully or partially heat cured .
Heat cure enhances the final cured properties. 50-Series Cat-L-Inks may also be cured by infrared radiation.
Recommended cured ink film thickness should be between 0.7-1.4 mils (0.017-0.035mm).
An extended cure of 30 min. @ 150°C (300°F) will result in low outgassing properties.

**Cured Electrical Properties**

| Property | Value * | Test Method |
|---|---|---|
| Insulation resistance, ohms | | Mil-I-43553A |
| @ 25/°C, initial reading | | ¶ 3.10 4.5.2.5 |
| 50-700R | $1.4x10^{8}$ | |
| 50-710R | $1.2 \times 10^{4}$ | |
| 50-770R | $>1.0 \times 10^{12}$ | |
| 50-771R | $>1.0 \times 10^{12}$ | |
| All Other Colors | $>1.0 \times 10^{12}$ | |
| Insulation resistance, ohms | | Mil-I-43553A |
| after humidity conditioning | | ¶ 3.10 4.5.2.5 |
| @ 77 ±10 °F and 95% RH for 48 hours | | |
| 50-700R | $1.7 \times 10^{8}$ | |
| 50-710R | $1.2 \times 10^{4}$ | |
| 50-770R | $>1.0 \times 10^{10}$ | |
| 50-771R | $>1.0 \times 10^{10}$ | |
| All Other Colors | $>1.0 \times 10^{10}$ | |

* All test samples were cured at 121°C (250°F) for 30 minutes. Variations in the cure schedule will affect electrical properties.



Issued: 8/00
Revised 7/01

## ACCESSORY PRODUCT DESCRIPTION

| | |
|---|---|
| **AD2001** | Thinner for nominal adjustments in viscosity. Incrementally add 3-6% by weight. |
| **AD2002** | Thinner for spray applications. Add 25-40% by volume. |
| **AD2003** | Retarder to extend open time. Incrementally add 3-6% by weight. |
| **AD3002** | Flow agent to eliminate crawling, pin-holing and bubbling. Incrementally add 2-4% by weight. Mix gently to avoid over mixing. |

## COLOR MATCH

Color matching to Federal Standard 595 and other opaque, custom colors are available. Contact Enthone Electronic Materials or an authorized D.E.M. distributor for details.

## PACKAGING

50-Series Cat-L-Inks are available in quart containers. 50-100R, 50-700 and 50-110RX are also available in gallon containers. Catalyst for quarts are packaged in quarter-pint containers. Catalysts for gallons are packaged in pint containers. Catalyst 5 is available as a special order and is not included in the price of the ink, as are the other catalysts. Catalyst 5 is available individually for quarts and gallons of ink.

## STORAGE AND HANDLING

50-Series inks and catalysts should be stored at or below room temperature (27$^{o}$C/80$^{o}$F maximum) and out of direct sunlight.

## HEALTH, SAFETY AND ENVIRONMENTAL

Information on the safety, health and environmental attributes of this product is set forth in the material safety data sheet (MSDS) and on the product label. Enthone provides the MSDS and product label to customers with all samples, as well as with the initial shipment of product and whenever an update is issued. Copies of the MSDS and label are also available at any time upon request.

The safety, health and environmental information set forth in the MSDS and label should be considered in determining the appropriateness of this product for any particular application, and should be used to determine appropriate engineering controls, protective equipment, work practices, and other precautions to be observed in the use of this product in any particular process or working environment.



Issued: 8/00
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**TROUBLESHOOTING**

| Problem | Cause | Cure |
|---|---|---|
| Bleed/Smear | Various | 1. Verify uniform screen mesh tension and off contact distance<br>2. Check sharpness of squeegee<br>3. Decrease off contact distance<br>4. Increase squeegee durometer<br>5. Reduce flood pressure<br>6. Increase print stroke speed<br>7. Reduce stencil thickness |
| Bubbling | 1. Screen mesh too coarse<br>2. Over aggressive mixing<br>3. Ink settling | 1. Use finer screen mesh<br>2. Gently hand mix<br>3. Stir ink from bottom of can<br>4. Add AD3002 flow agent |
| Under Cure | 1. Incorrect ink: catalyst mix ratio<br>2. Insufficient cure schedule<br>3. Insufficient air movement in oven<br>4. Expired catalyst | 1. Verify mix ratio<br>2. Confirm cure schedule time and temperature<br>3. Increase air circulation/ventilation<br>4. Check/clean exhaust duct(s)<br>5. Confirm expiration date on label |
| Poor Adhesion | 1. Surface contamination<br>2. Insufficient cure schedule<br>3. Incorrect ink: catalyst mix ratio | 1. Remove all surface residue and debris<br>2. Confirm cure schedule time and temperature<br>3. Verify mix ratio |
| Ink Drying in Screen | 1. Screen left unattended<br>2. High shop temperature<br>3. End of pot life | 1. Keep screen flooded with ink when not in use<br>2. Replenish ink supply frequently<br>3. Reduce room temperature<br>4. Mix fresh batch of ink<br>5. Retard with AD2003 or carbitol acetate |
| Ink Thickens Prematurely | 1. Over catalyzed<br>2. Evaporation of solvent<br>3. High shop temperature | 1. Verify mix ratio and mix fresh ink<br>2. Keep catalyzed ink covered<br>3. Reduce room temperature<br>4. Retard with AD2003 or carbitol acetate |



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## MATERIAL SAFETY DATA SHEETS

For more detailed information on the toxicological properties of the products described herein, reference can be made to the Material Safety Data Sheet (MSDS) for each product. If you do not have the proper MSDS, it can be requested from: Enthone Inc., attention: Regulatory Affairs Department, P.O. Box 1900, New Haven, CT 06508. For emergency assistance call CHEMTREC (800) 424-9300.

## WARRANTY AND DISCLAIMER

The information presented herein is to the best of our knowledge true and accurate and all recommendations and suggestions appearing in this bulletin covering the use of our products are based upon information believed to be reliable. However, since the conditions of use are beyond our control, this information is given on the express condition and agreement that Enthone Inc. will not be liable to any person in contract, tort (including negligence), strict liability or otherwise for any claims, damages or losses whatsoever. Nothing herein shall be deemed a recommendation to use any product or process in violation of any existing patent rights and no warranties, expressed or implied, are made regarding the information, product, processes, recommendations, description and safety notations contained herein. The above includes proprietary information of Enthone Inc. and is furnished to you for your use solely on products or processes supplied by us to you.

## Enthone-OMI (Canada) MATERIAL SAFETY DATA SHEETS

For detailed information on the toxicological properties of the products described herein, reference can be made to the Material Safety Data Sheet (MSDS) for each product. If you do not have a current MSDS, it can be requested from the W.H.M.I.S. coordinator, Enthone-OMI (Canada) Inc., 121 Watline Avenue, Mississauga, Ontario, L4Z-1P2. For emergency assistance regarding accidents with this product resulting in container rupture, spills, poisoning, bodily injury or threats to health call: CHEMTREC (800) 424-9300.

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## CUSTOMER ORDER CENTERS

| | | |
|---|---|---|
| UNITED STATES | West Haven, Connecticut | (800) 496-8326<br>Fax (203) 933-0249 |
| | Londonderry, New Hampshire | (800) 877-9871<br>Fax (603) 645-4402 |
| SEL-REX® Precious Metal Products | (Phone: 8AM-6PM, M-F, East Coast time)<br>(Fax: 24 hours, 7 days) | (800) 560-7214<br>Fax (203) 932-8688 |
| CANADA | Mississauga, Ontario | (800) 387-3766; (905) 507-9949<br>Fax (905) 507-9943 |
| | Pointe Claire, Quebec | (514) 426-1451<br>Fax (514) 426-1453 |
| MEXICO | Mexico, D.F. | (011-52-5) 587-1700<br>Fax (011-52-5) 567-6326 |



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Issued: 8/00
Revised 7/01