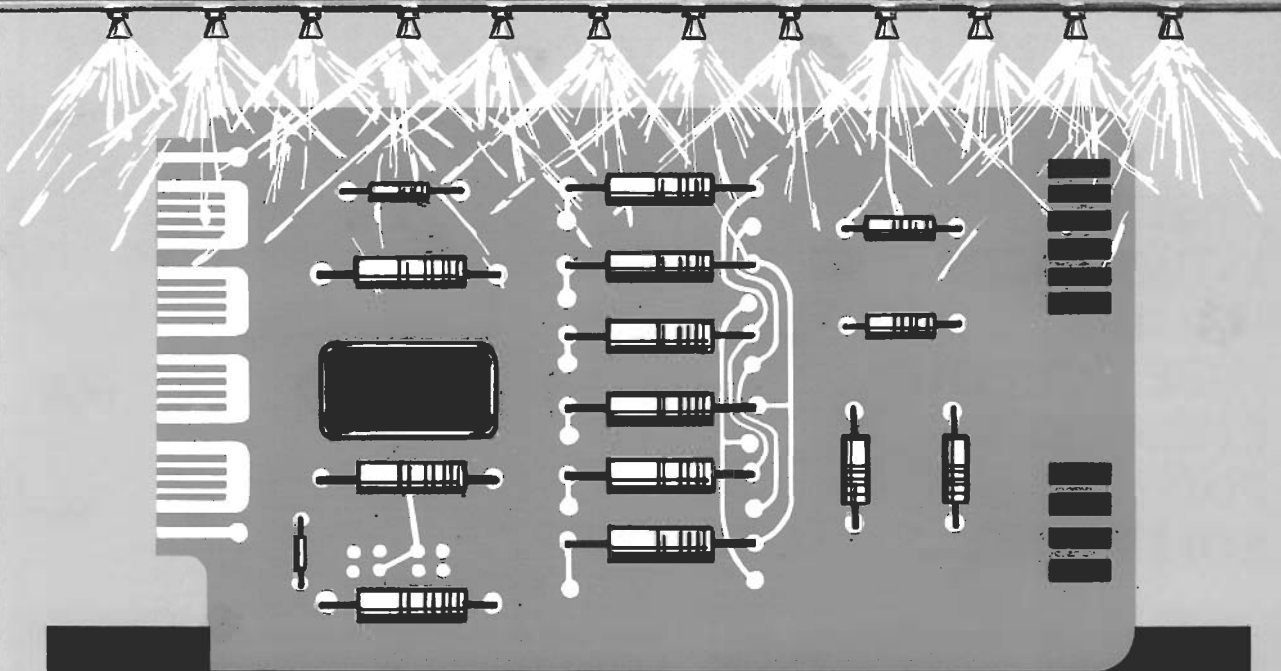


Water and Electronics Can Mix



WITH
KESTER

#254 Halide-Free Flux Cored Solder Wire
#2154 Halide-Free, Foaming Organic
Water Soluble Flux
PDL-1 Paste Solder, Type HF-54D

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WATER AND ELECTRONICS CAN MIX

KESTER INTRODUCES HALIDE FREE AQUEOUS CHEMISTRY FOR SOLDERING

Soldering in the electronics industry often involves a choice between using rosin fluxes and water soluble organic fluxes. The rosin fluxes most commonly used contain some chlorides (usually 0.2-0.5%) while the organic fluxes used typically or historically have from 1.5-5% chloride content. The removal of the rosin flux residues has traditionally been accomplished by the use of organic solvents, although in recent years there has been an increasing use of "detergents" which allow flux removal with water by reacting with rosin to produce water soluble rosin soaps. The residues from the organic fluxes are removed either with water or with water-neutralizer solutions. Regardless of which type of flux residue or which removal procedure is used, there is always a great deal of concern—quite legitimately—as to whether or not all of the ionizable chlorides have been removed.

These chloride residues from organic or activated rosin fluxes are often difficult to completely remove, and by their hygroscopic nature, may be corrosive or electrically conductive—unacceptable conditions for modern-day electronic assemblies.

The Kester Research Laboratory has developed and introduced a series of unique products which are completely free of halides, which are designed for those applications where water is the preferred flux residue remover.

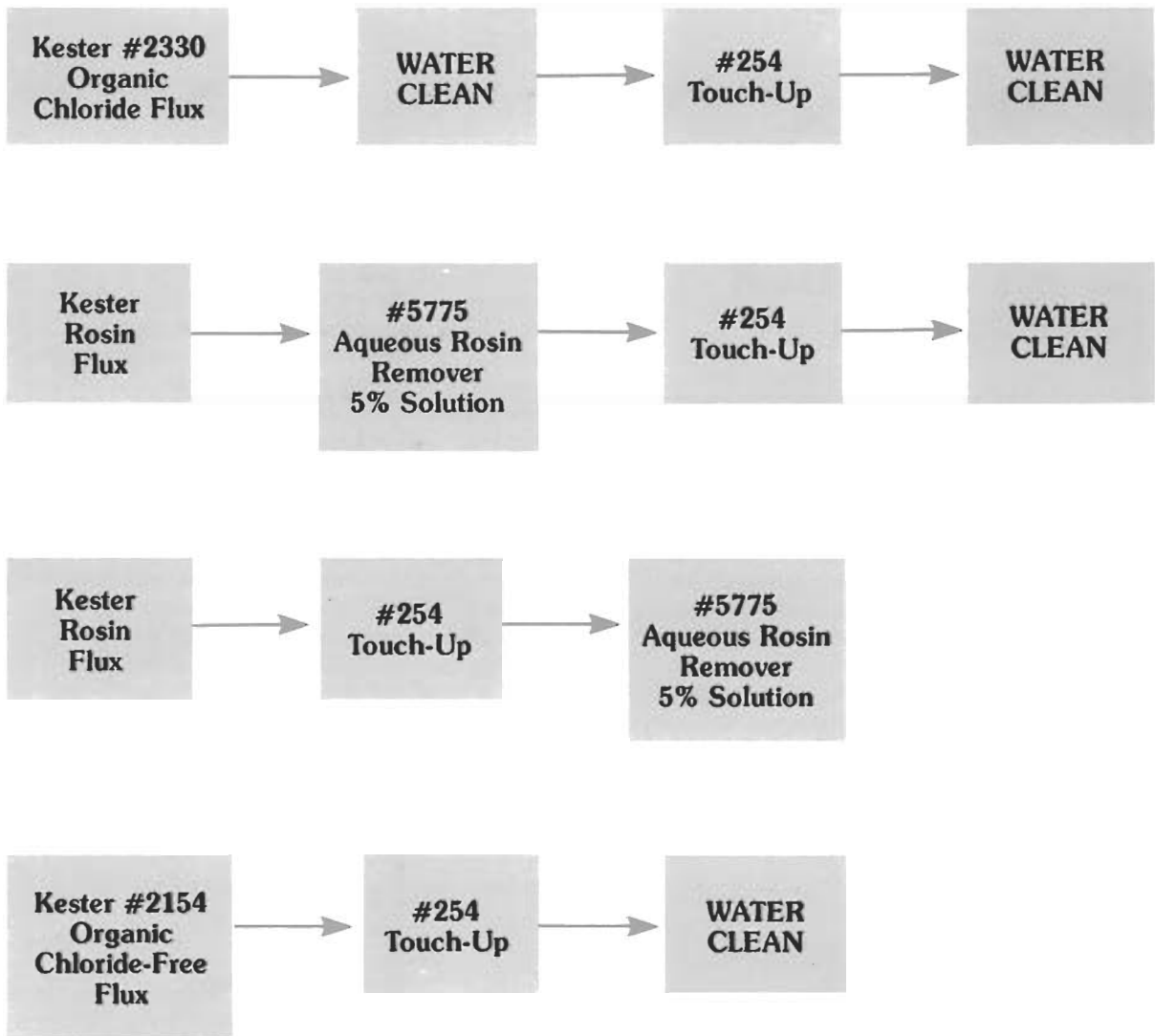
At the present time there are available from Kester three products, each compatible with the other two. Included in this group are a flux cored solder wire, a foaming flux for wave soldering or dipping applications and a paste solder formulation. Information about each of these products follows.

KESTER #254 HALIDE-FREE FLUX CORED SOLDER WIRE

No. 254 Flux Core Solder contains mildly acidic organic activators which are water soluble and yet completely free of halides (chlorides, bromides, etc.). Although this flux may begin to char or become hard to remove when subjected to the excessive soldering temperatures of 800°F or over, it will provide soldering comparable with activated rosin fluxes when this cored solder flux is used under more normal soldering conditions. With a recommended soldering iron tip temperature no greater than 800°F and a dwell time of under 5 seconds per joint, excellent soldering can be accomplished and the residue can easily be removed with warm water (130-150°F). Humidity chamber tests were conducted on circuit boards soldered with Kester #254 flux cored solder wire and then routinely cleaned with warm deionized water. Results from these tests indicate that any undetected traces of flux which may have remained behind after the cleaning operation did not produce corrosion, fungus, or mold growth. Although #254 flux is somewhat hygroscopic and therefore, may become electrically conductive, soldered samples left several weeks in a production environment without removing the flux showed no evidence of the flux residue having caused any detectable corrosion products. Insulation resistance tests indicate negligible attack on the glass-epoxy insulator of G-11 circuit boards.

Because of the unique properties exhibited by Kester #254 flux core, this product is particularly suited for use in touch-up soldering where water cleaning is desired for flux residue removal. Because this flux does not have the corrosive potential associated with chlorides, a repaired printed circuit board may be stored temporarily before removing the flux residue without causing problems brought on by chloride type corrosion. Although flux which is removed immediately after soldering while still warm is the easiest to remove, flux residues removed after storing for four months were found to rinse away quite readily. Thus, use of #254 allows for greater flexibility in production operations.

Kester #254 flux cored solder is the answer for production line soldering where it is not practical to remove flux residues with hazardous solvents. A suitable system for flux removal might be the use of hot tap water to remove the flux followed by a rinse with distilled or deionized water to remove any ionic contamination introduced by the tap water. If excessive heat during the soldering process causes the flux residue to become difficult to remove with water, the residue can still be removed. Tests have shown that Kester #5775 Bio-kleen aqueous rosin residue remover when diluted to a 10% solution (for this particular application) will dissolve the residue. The solution should be used at 140-150°F and be agitated. A water rinse will remove the solubilized residue. This type of system not only eliminates the necessity to purchase costly degreasing equipment and solvents but it also provides a safe, efficient means to remove the soldering flux residues. Depending on the type of liquid flux used in automated soldering applications, the following diagrams indicate some possible systems in which #254 flux cored wire solder may be utilized advantageously.



PROPERTIES OF #254 FLUX

Halide Content	None
Water Solubility	Complete (with proper use)
pH (10% Water Solution)	2.3

KESTER #2154 HALIDE-FREE, FOAMING ORGANIC WATER SOLUBLE FLUX

Recent concern over the environmental impact of continuing to allow fluorinated and chlorinated solvents to escape into the earth's atmosphere has had a great deal to do with the development of #2154 flux. Although many manufacturers who wave solder printed circuit boards have wanted to switch to a water cleaning system, they have been quite hesitant about using the highly active chloride containing organic water soluble fluxes which were available. For those who wished to use a mild flux there was only one acceptable choice—a rosin flux followed by an

aqueous rosin residue remover. Kester #2154 incorporates all the chemical features of #254 which have already been discussed, plus it produces the even head of foam so necessary for good wave soldering process control. The solvent system basically alcohol-water has been combined with efficient water soluble mildly acidic organic activators to produce the excellent performance of #2154. As with #254, Kester #2154 foaming flux contains no potentially corrosive halides and produces the type of soldering results expected from the best rosin fluxes. The flux residue readily rinses away with warm water—particularly well in an in-line cleaning system. Touch-up with either #254 cored wire solder or with PDL-1, Type HF-54D paste solder can provide a good compatible system.

PROPERTIES OF #2154 ORGANIC FLUX

% Solids	18.1	pH (10% Solution)	2.4
Flash Point (T.O.C.)	101°F	Halide Content	None
Thinner	#4154	Specific Gravity @ 75°F	0.940

KESTER PDL-1 PASTE SOLDER, TYPE HF-54D

As with Kester #254 and #2154, PDL-1 Paste Solder Type HF-54D has an organic water soluble flux, the residue of which may be readily removed with water. A 10% water solution of Kester #5775 may be required to remove residues which have been subjected to excessive heating. Also, the flux is halide free. Designed primarily for syringe dispensing, Type HF-54D paste solder has a pseudoplastic rheology. This paste may be used in most applications where

wire solder is used. It is particularly suited to replace the use of small diameter wire as the quantity of solder actually applied to a joint can be carefully controlled and be reproduced time after time. A syringe needle of 18-gauge or larger is recommended for the 200 mesh product, while a 22-gauge or larger needle can be used for the 325 mesh product. Another use of this paste is as an "inspection paste" for touch-up work. By applying a dab of the gray paste on a joint which needs rework, the inspector is pointing out to the solderer what needs to be soldered and at the same time is saving money for his company by applying the precise amount of solder actually needed to do the job. The procedure can minimize unnecessary touch-up or the remelting of joints which do not require reworking.

PROPERTIES OF PDL-1 PASTE SOLDER, TYPE HF-54D

Metals Content	80%
Halide Content	None
pH (Water extract, 10% dilution)	2.3
Recommended Alloys	Those melting below 450°F

CONCLUSION

Although each of the products described here should be evaluated for its particular merits, it is important to note that each is part of a product group. Kester #254 Cored Solder Wire, Kester #2154 Organic Flux and Kester PDL-1 Paste Solder Type HF-54D were developed to be compatible with one another. Therefore, by

successfully using any one of the three products, the production engineer should have little difficulty incorporating either or both of the other two products into the manufacturing scheme. All three products have the same organic, halide-free chemistry. For this reason it is easy to design a system which will utilize more than one of them.



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