MOTOROLA INC.
Communications
Sector

REMOVAL AND REPLACEMENT OF CHIP COMPONENTS ON CIRCUIT BOARDS

1. GENERAL

1.1 The equipment described in this instruction manual employs many chip capacitors, resistors, transistors, and diodes as circuit elements. Chip components are normally located on the solder side of those circuit boards using them.

1.2 During manufacture, chip components are positioned at the desired location on the circuit board by a three step, automated process. The first step in the process applies two epoxy glue dots to the specified chip component location on the circuit board. During the second step, the chip component is automatically (not by hand) applied to the desired location. After all chip components are located, and the epoxy glue dots have been allowed to cure, the circuit board is wave soldered in the third step of the process. The epoxy glue is provided with enough heat resistance to hold the chip components in place during the short wave soldering process.

1.3 Circuit board mounted chip components can be repaired, provided adequate care is taken to avoid "leaching" the chip component end terminations or lifting the circuit board copper pads. "Leaching" is caused by application of excessive heat to the component end terminations and is most often evidenced by failure of the chip component to take solder. Refer to Figure 1.

1.4 The chip components used in this equipment are manufactured with a plated metallic (nickel or similar metal) soldering barrier beneath the tin component end terminations. This barrier greatly reduces the possibility of the chip component being susceptible to "leaching".

1.5 As a result, the chip components used in this equipment are more durable than those previously encountered. Damage is still possible if non-temperature controlled soldering irons are used or if heat is applied to the component for a lengthy period of time. Normal 60-40 tin-lead solder may be used to solder these chip components.

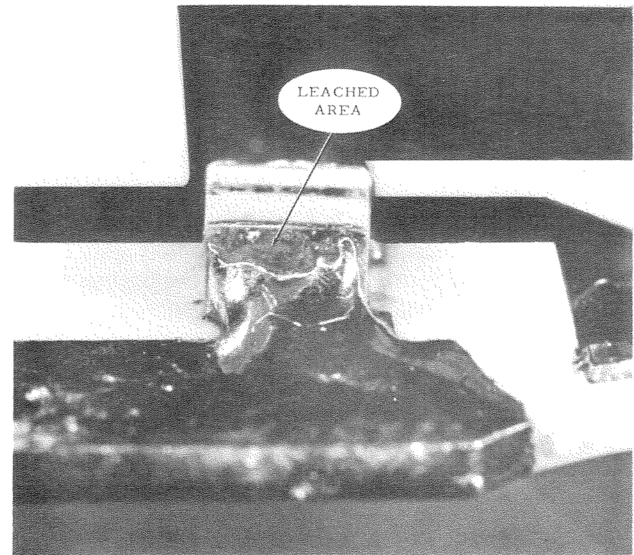

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Figure 1. Example of "Leached" Chip Component

2. CHIP COMPONENT REPAIR PROCEDURES

2.1 GENERAL

Table 1 lists the recommended tools to be used for removal and replacement of circuit board mounted chip components.

Table 1. Chip Component Servicing Tools

Type	Motorola Part Number	Minimum Specification
Heated Tweezers	1-80386A62	Temperature set at 550°F
Soldering Iron	1-80382A44	Temperature Set at 550°F
Tweezers	ST-492	1/16" Tips, minimum

2.2 CHIP COMPONENT REMOVAL

Chip components are very reliable. Care should be taken while troubleshooting to insure that the part in

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question is indeed defective before removal is undertaken. If a chip component is deemed defective, or is visibly damaged, it must be replaced. Several methods can be used to remove the defective part from the circuit board. The exact method used depends upon the skill or experience of the technician, and the available service aids.

2.2.1 Heated Tweezers Method of Removal

A Heated Tweezers System (Motorola Part No. 1-80386A62) allows for easy chip component removal. The tweezers are first heated and then applied to both terminations of the chip component to be removed. After the solder is melted sufficiently, the chip components can be lifted from the circuit board. Refer to Figure 2.

NOTE

If the chip component does not easily lift up after the solder is melted, more heating time is required to soften the epoxy glue dots, which originally attached the part to the circuit board before it was soldered.

2.2.2 Two Soldering Irons Method of Removal

Two temperature controlled soldering irons (Motorola Part No. 1-80382A44) set at 550 °F may be used to remove a defective chip component. This method is similar to the method described in the previous paragraph. Place the soldering irons, simultaneously, against each termination of the chip component to be removed. After heating sufficiently to melt the solder and the epoxy glue dots (as stated in the previous paragraph) lift the chip part, with the two soldering irons, off of the circuit board. Refer to Figure 3.

2.2.3 One Soldering Iron Method of Removal

Loosen the solder joints at the chip component end terminations by alternately applying enough heat with a single temperature controlled soldering iron to each joint until the solder just melts. As the solder reflows, use a pair of tweezers to twist the chip component to break the adhesive joints between the component body and the circuit board pads. Then, repeat heating if necessary, and remove the chip component.

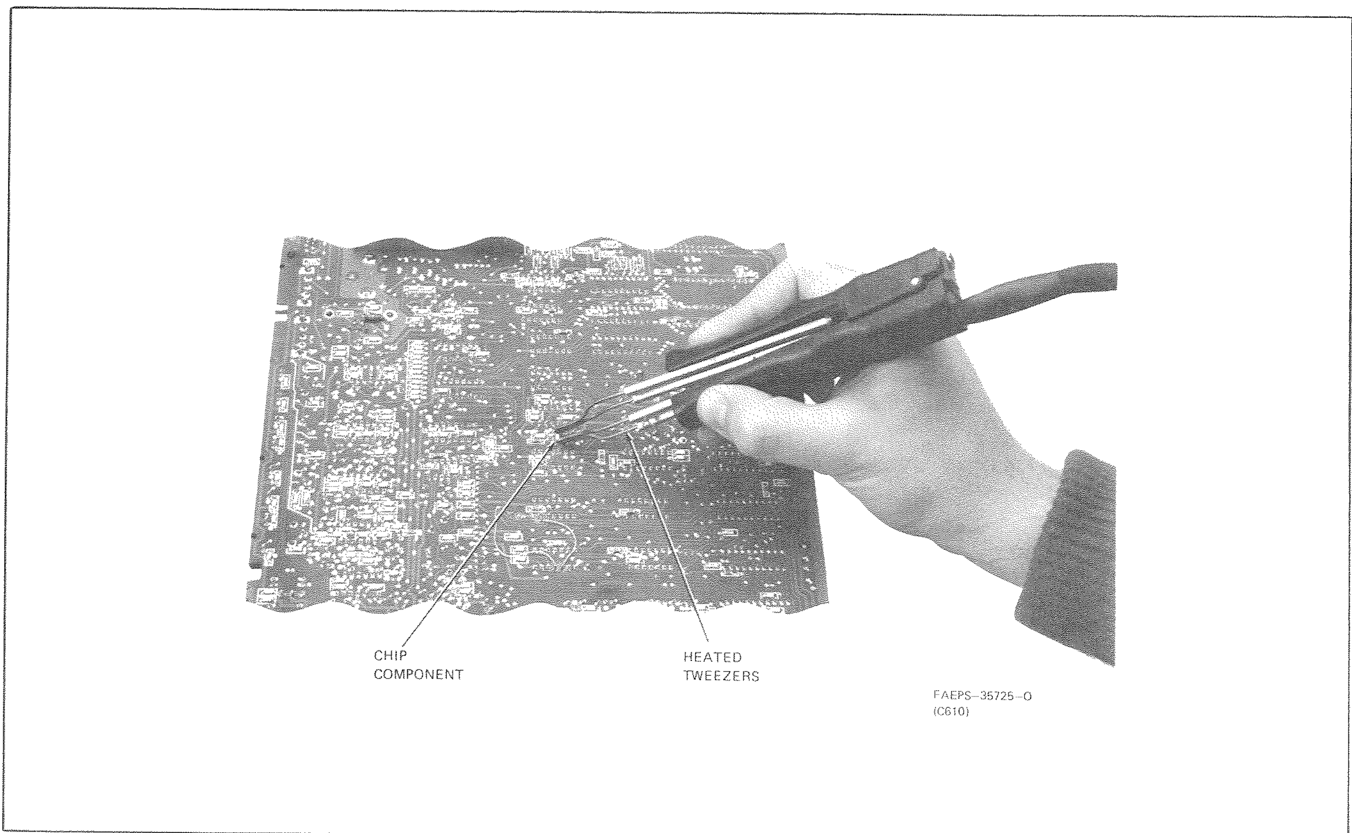

Figure 2. Removal of Chip Component Using a Heated Tweezers

2.3 CHIP COMPONENT TESTING

Once a chip diode, transistor, or resistor is removed from the circuit board it can be tested in the normal manner using any high quality ohmmeter. Chip capacitors, however, should not be reused since internal damage may still have occured when the part was removed. Chip capacitor damage may not be noticed when the part is tested at room temperature.

2.4 CHIP COMPONENT REPLACEMENT

CAUTION
The soldering instrument(s) temperature *must never* exceed 550 °F.

2.4.1 Circuit Board Preparation

Remove any excess solder from the foil location pads of the chip component by using a solder removal tool or solder braid. Any excess buildup of epoxy glue between the foil pads must also be removed to insure that the new chip component will solder properly into place. The circuit board is properly prepared when the chip component can be placed on the circuit board and the end terminations (tabs) of the chip make contact with the mounting foil. The chip should be flush with the circuit board at all points, and the foil pads should be clean and ready to accept solder.

2.4.2 Installation With Heated Tweezers

Step 1. Insure that the circuit board is prepared properly as discussed in the previous paragraph.

Step 2. Properly position (center) the new chip part on the circuit board foil pads.

Step 3. Heat the tweezers to 550 °F, and sparingly apply 60-40 tin-lead solder to the tabs of the chip part.

Step 4. Insure proper solder wetting at the tabs of the chip part and on the circuit board foils before removing the tweezers.

Step 5. Allow the chip part to cool.

Step 6. Visually inspect the chip part to insure that good solder wetting occured and no visible damage to the chip part exists.

2.4.3 Installation With Temperature Controlled Soldering Iron

Step 1. Insure that the circuit board is prepared properly as discussed in the previous paragraph.

Step 2. Properly position (center) the new chip part on the circuit board foils.

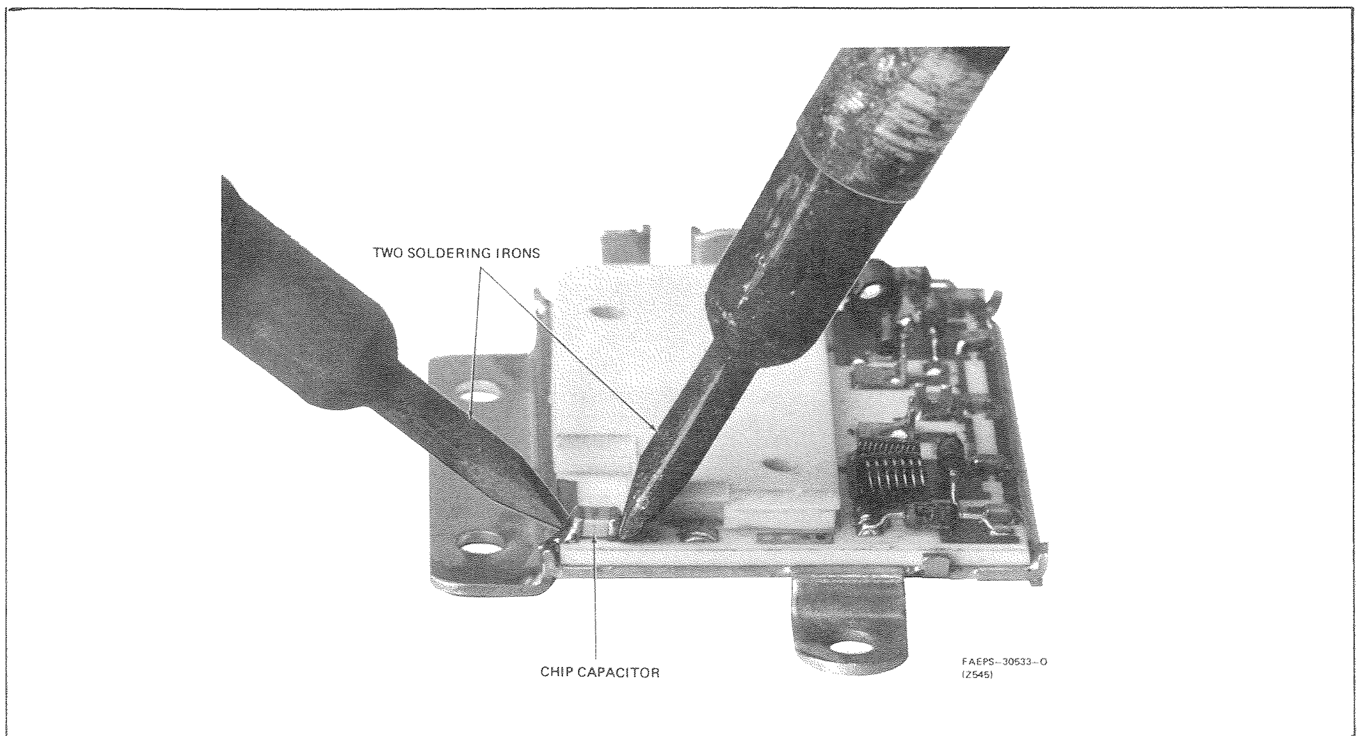

Figure 3. Removal of Chip Component with Two Soldering Irons

Step 3. Heat the soldering iron and apply a small amount of 60-40 tin-lead solder to the tip.

Step 4. Hold the chip part in place with a tweezers or a plastic tuning tool (with metal tip) while soldering one tab of the chip part to the circuit board foil.

Step 5. Insure proper solder wetting at the tab of the chip part being soldered and on the circuit board foil pads before removing the soldering iron.

Step 6. Allow the chip part to cool.

Step 7. Solder the remaining tab(s) of the chip part in the normal manner.

Step 8. Visually inspect the chip part to insure that good solder wetting occured and no visible damage to the chip part exists.