STANDARD OVERHAUL PRACTICES MANUAL

LOW HYDROGEN EMBRITTLEMENT STYLUS CADMIUM PLATING

PART NUMBER NONE

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STANDARD OVERHAUL PRACTICES MANUAL

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To: All holders of LOW HYDROGEN EMBRITTLEMENT STYLUS CADMIUM PLATING 20-42-10.

Attached is the current revision to this STANDARD OVERHAUL PRACTICES MANUAL

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Location of Change	Description of Change
20-42-10	
PGBLK 20-42-10-0	Added clarification for the chromate conversion coatings that can be used.

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Subject/Page	Date
TITLE PAGE	
O 1	Jul 01/2009
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20-42-10 TRANSMITTAL LETTER	
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1	Nov 01/2006
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20-42-10 REVISION RECORD	
1	Jul 01/2005
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1	Jul 01/2005
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R 1	Jul 01/2009
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7	Nov 01/2008
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A = Added, R = Revised, D = Deleted, O = Overflow

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All revisions to this manual will be accompanied by transmittal sheet bearing the revision number. Enter the revision number in numerical order, together with the revision date, the date filed and the initials of the person filing.

Revision		Filed		Revision		Filed	
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INTRODUCTION

1. General

A. The instructions in this manual tell how to do standard shop procedures during maintenance functions from simple checks and replacement to complete shop-type repair.

B. This manual is divided into separate sections:

(1) Title Page

(2) Transmittal Letter

(3) Highlights

(4) Effective Pages

(5) Contents

(6) Revision Record

(7) Record of Temporary Revisions

(8) Introduction

(9) Procedures

C. Refer to SOPM 20-00-00 for a definition of standard industry practices, vendor names and addresses, and an explanation of the True Position Dimensioning symbols used.

D. The data is general. It is not about all situations or specific installations. Use it as a guide to help you write minimum standards.

E. If the component overhaul instructions are different from the data in this subject, use the component overhaul instructions.

LOW HYDROGEN EMBRITTLEMENT STYLUS CADMIUM PLATING

1. INTRODUCTION

A. The data in this subject comes from Boeing process specification BAC5854 for low hydrogen embrittlement stylus cadmium plating.

B. The data is general. It is not about all situations or specific installations. Use this data as a guide to help you write minimum standards. Equivalent procedures can be used.

C. Do not apply this plating on CRES parts. Use brush cadmium plating (BAC5849) on CRES parts.

D. Refer to SOPM 20-00-00 for a list of all the vendor names and addresses.

2. MATERIALS AND EQUIPMENT

A. Materials

NOTE: Equivalent substitutes can be used.

(1) Cadmium Stylus Plating Solution

(a) Selectron LHE (SPS-5070), V13929 or V1B534

(b) Dalic Cadmium Code 2023, V11924

(c) LDC-4803, V56878

(2) Gauze tubing (Cotton, Dacron or cotton/Dacron surgical tubing) – Johnson and Johnson Surgitube, V99742

(3) Cotton batting – long fiber, lint-free, USP surgical grade

(4) Masking material, acid and alkaline resistant, electroplaters – Scotch 470, V76381

(5) Pressure sensitive tape, 60 ounce/inch tack or greater (such as Scotch 250, V76381); not more than 6 months from date made unless tested per ASTM D3330 Method A (BAC5854 PSD 6-11) (such as Scotch 250, V76381)

(6) Chromate conversion coating, manually applied

(a) Iridite 8, V0PX54 (new supply not available)

(b) Ultrachromate 300, V64709

(c) Any other manually applied chromate coating

(7) Filter paper – Whatman No. 4, V58485

B. Equipment

NOTE: Equivalent substitutes can be used.

(1) Power Supply – adjustable 30 volts dc, 25 amperes output, circuit breaker protected, with ampere-hour meter readable to 0.01 ampere-hours, voltmeter, ammeter. Accuracy of each meter must be +/-5%. (Selectron type 2530 or 6035, V13929)

(2) Styli with aluminum cores cut for cooling, with plastic handle cover, and that can hold different sizes and shapes of anodes. (Selectron types MS, LR, SF, LF, HR, LA, PT, V11924 or V13929)

(3) Rotary Anode Tool – Variable speed, 0-900 rpm, to turn anodes in forward or reverse, with stepless speed control (Selectron Rotostylus, V11924, V13929, or V1B534)

(4) Anodes – With flat, convex, or concave shapes for the surface to be plated. Materials:

(a) High purity, high density graphite

(b) Plating, clad plating, or plating alloys

1) Platinum
2) Platinum-Indium
3) Platinized Niobium
4) Platinized Titanium

(5) Industrial Abrasive Unit – Single nozzle unit to supply an abrasive stream with adjustable flow rate and pattern area. (S.S. White Industrial Airbrasive Unit Model F, V79555 or V97945)

3. GENERAL

A. Stylus plate only in areas with protection or away from corrosive atmospheres and operations that make dusts or fumes, such as grinding, polishing, buffing, abrasive cleaning, tank plating, and area maintenance cleaning.

B. The part must be at ambient temperature, above 32°F (so plating solutions and rinse water do not freeze), but sufficiently cool so the surface does not dry during the plating procedure.

C. Complete all machining, forming, welding or brazing before plating. Unless specified by the overhaul instructions, plate only areas that are smooth, and have no more than a few blemishes, pits, tool marks, weld flash, slag or other defects. The evenly textured surface made during abrasive cleaning is acceptable.

D. Preplate stress relief is not necessary for this stylus plating.

E. Parts must not be stylus plated while under load; that is, the part must not be in an assembled or installed condition where external forces could push or pull on it.

F. Apply the plating to the thickness specified by the overhaul instructions. If the overhaul instructions do not give a thickness, apply a minimum of 0.0005-inch of plating. This minimum thickness is not necessary on holes of less than 0.75-inch diameter or internal curved surfaces of less than 0.375-inch radius, but these surfaces must be plated for the ampere hours calculated to give 0.0005-inch plating thickness.

G. To calculate the number of ampere-hours necessary to stylus plate a specified thickness, multiply the number of ten-thousandths of an inch by 0.006 for Selectron LHE (SPS-5070) or 0.007 for Dalic 2023 or LDC-4803 and then by the number of square inches to be plated. For example, to stylus plate 0.0005 inch of cadmium on 4 square inches of surface with the Dalic or LDC solution will use 5 x 0.007 x 4, or 0.140 ampere-hours.

H. As applicable (such as when you plate a small inner diameter), you can use a rotary tool to turn the anode. Also (such as when you plate an outer diameter), you can use a lathe or turning head (up to 900 rpm) to turn the part.

I. The maximum area to be stylus plated at one time is 12 square inches.

J. Stylus plating does not require subsequent baking, if the total area stylus plated is not larger than 72 square inches. But if you stylus plate before a bake per SOPM 20-42-02 or SOPM 20-42-01, bake the parts as usual, as specified in those subjects.

K. To prevent separation of the solids, do not keep or use stylus plating solutions below 65°F. Keep new solutions in their original containers. Do not put used solution back into the original containers. Discard all used solutions or a solution which touched a part or a stylus plating anode.

4. ANODE PREPARATION

A. Use an anode which best agrees with the configuration of the part. For small holes, use 0.060- to 0.100-inch inert platinum anodes.

B. A different wrapped anode is necessary for each type of solution used. Do not move any wrapped anode from one solution to another.

C. Preparation of straight rod stylus and anode (Figure 1).

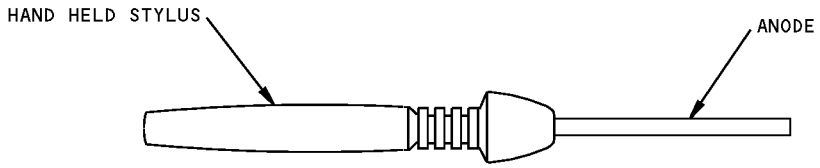
(1) Remove oxidation or corrosion products from the metal stylus base with abrasive cloth. Remove loose carbon particles from the carbon anode part of the stylus assembly with abrasive cloth. Assemble the carbon anode to the stylus base, and tighten the stylus chuck for good electrical continuity.

(2) Tear off (do not cut) a thin layer of cotton batting, rectangular in shape approximately equal to the length, and of sufficient length to make three wraps of the anode. If this will be a long task, wrap the anode in filter paper first, before the cotton wrap, to keep carbon particles from the anode out of the solution.

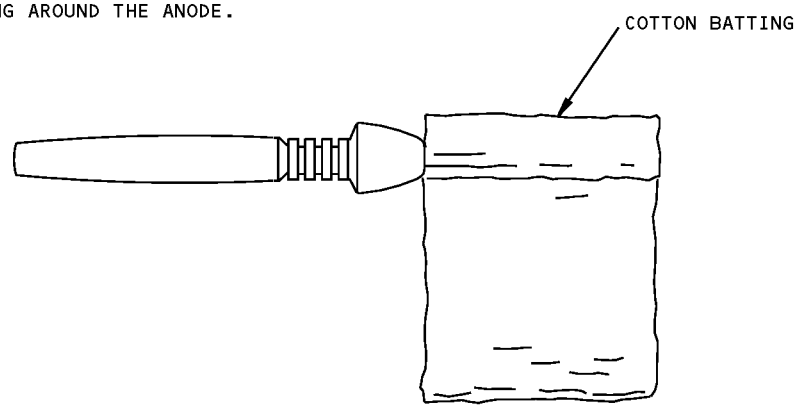
(3) Wet the carbon anode with water and roll cotton around the anode, as shown. Wrap it tightly, without lumps or thin spots. Use gauze tubing as an outside covering sleeve. Rinse the sizing from the gauze tubing in tap water. Then install the gauze tubing with a standard plastic or aluminum finger splint, as shown.

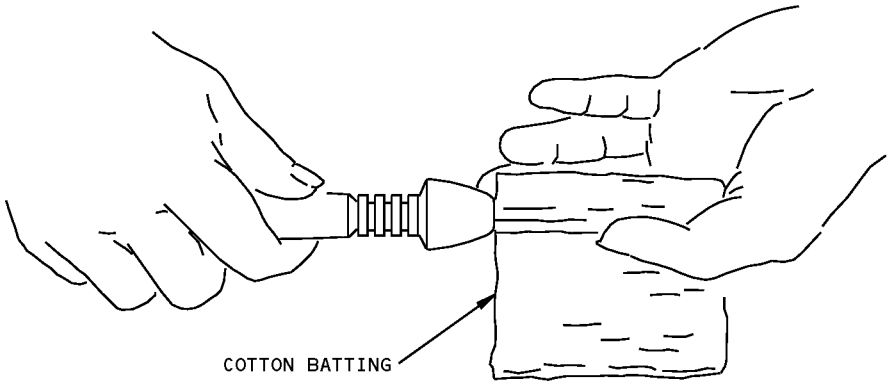
D. Prepare anodes of different shapes with an equivalent procedure, such as shown for the concave stylus in Figure 2.

E. Immediately after you use the anodes, remove the gauze and cotton, disassemble the stylus assembly, rinse fully, and dry with a blast of clean, dry air.

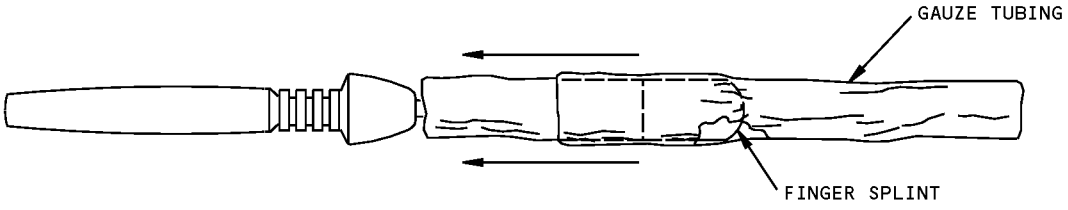


1. ROLL COTTON BATTING AROUND THE ANODE.



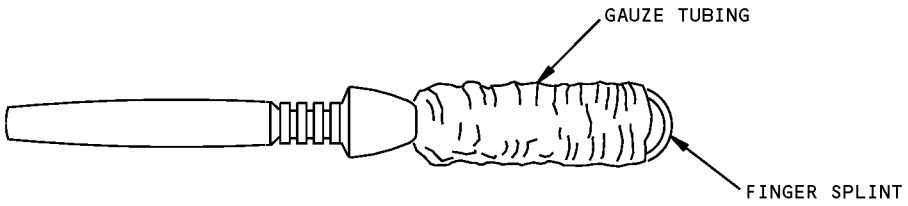


2. PUT A FINGER SPLINT OVER THE ROLLED COTTON.
3. SLIDE GAUZE TUBING OVER THE FINGER SPLINT AND THE COTTON.

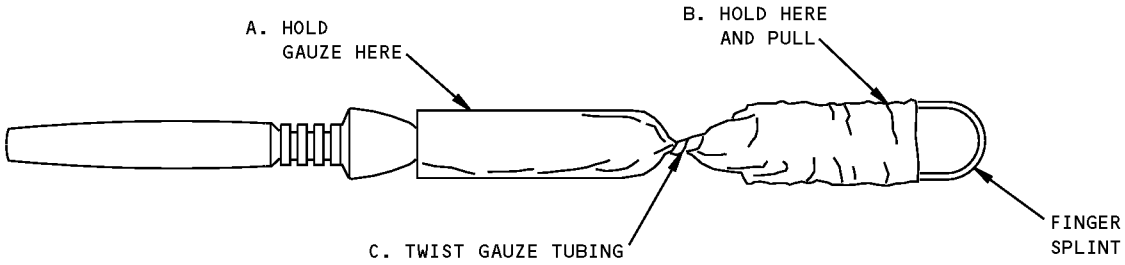


Straight Rod Stylus Preparation
Figure 1 (Sheet 1 of 2)

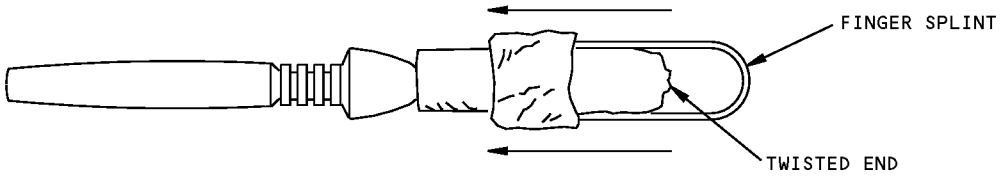
4. PUSH THE GAUZE TUBING ALL THE WAY ON TO EXPOSE THE FINGER SPLINT.



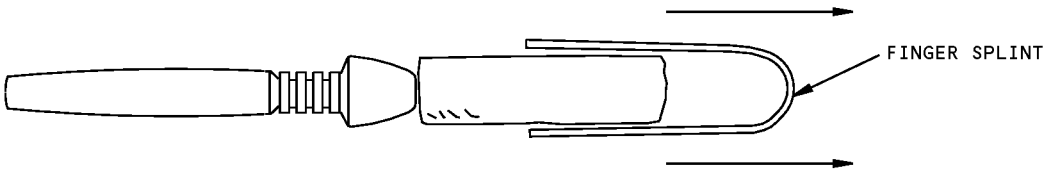
5. HOLD THE INNER END OF THE GAUZE TUBING IN POSITION ON THE ANODE. PULL THE FINGER SPLINT AND THE OTHER END OF THE GAUZE TUBING UNTIL THE TUBING IS FULLY EXTENDED. THEN TWIST THE GAUZE TUBING AS SHOWN.



6. PUSH THE GAUZE TUBING BACK OVER THE END OF THE ANODE.

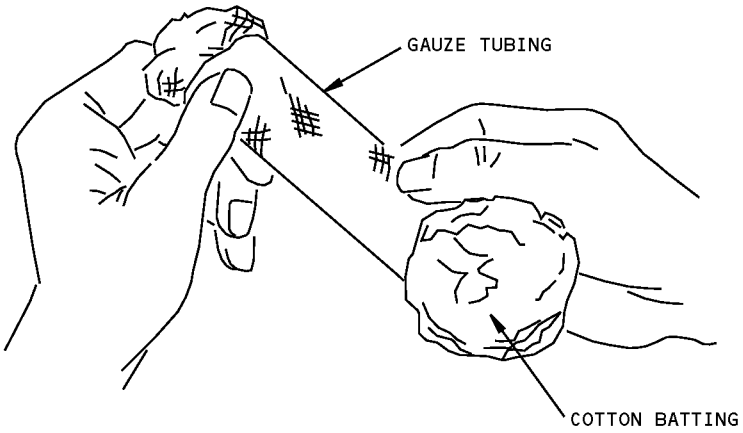


7. WHEN THE GAUZE TUBING IS FULLY PUSHED BACK ON THE ANODE, REMOVE THE FINGER SPLINT.

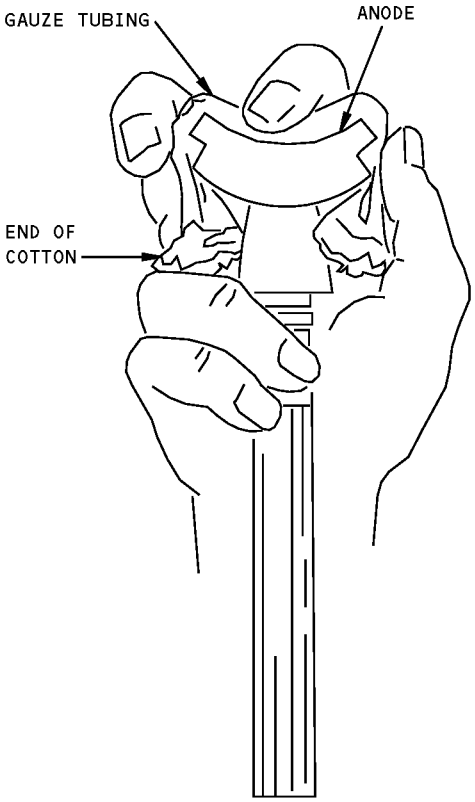


Straight Rod Stylus Preparation
Figure 1 (Sheet 2 of 2)

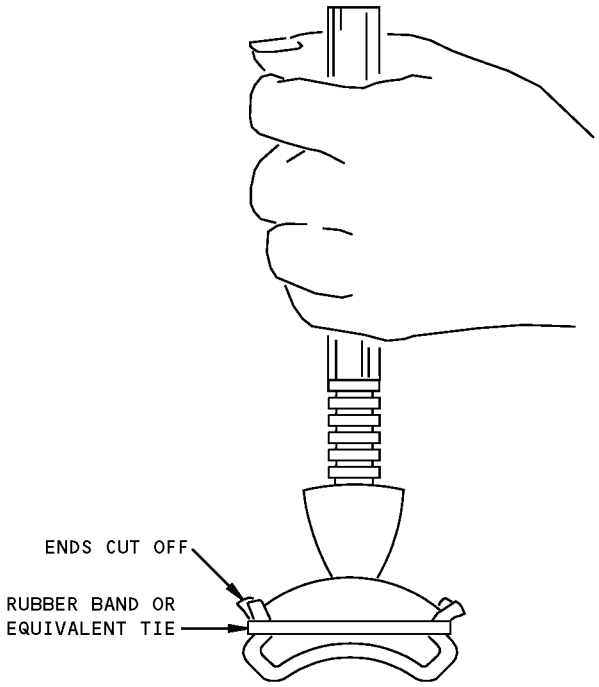
1. PUT COTTON BATTING THROUGH GAUZE TUBING.



2. WRAP THE GAUZE TUBING AROUND THE ANODE.



3. TIE THE TUBING TO THE ANODE. CUT OFF UNWANTED LENGTHS.



Concave Stylus Preparation (Typical)
Figure 2

5. SURFACE PREPARATION

A. Manually solvent clean the area per SOPM 20-30-03 to remove lubricants, dirt or other contamination. Dry the area fully.

WARNING: CADMIUM DUST AND FUMES ARE POISONOUS. DO NOT BREATHE THE DUST OR FUMES. DO THE ABRASIVE CLEANING IN A LOCAL EXHAUST BOOTH, OR WEAR APPROVED DUST RESPIRATIONS. WASH YOUR HANDS BEFORE YOU EAT OR SMOKE.

B. Dry-abrasive clean the area per SOPM 20-30-03, or manually sand the area with aluminum oxide or silicon carbide grit. Make a bare area around the defect, and an area of the plate as shown (Figure 3). This will become an area of overlap between the new stylus plating and the original plating. Do not use power tools on steels heat-treated above 220 ksi.

C. Remove the abrasive dust with a clean cloth wet with solvent.

D. Apply masks as necessary to give limits to the area to be plated and to prevent contamination or damage to the adjacent area from plating solutions and rinse water. The masks can be applied before you abrasive clean the area. Be sure to give protection to areas which could catch solutions, such as faying surfaces, recesses and internal surfaces.

6. STYLUS PLATING

A. Apply the cadmium stylus plating solution to the surface to be plated with a squirt bottle, cotton, cheesecloth, brush, or equivalent.

B. As shown in Figure 4, put the anode on the area, start the correct movement, and then energize the current. Do not let the anode stop on the area to be plated while the current is energized.

C. During the stylus plating operation, keep the stylus and anode assembly parallel to the surface, as shown. Use a minimum of pressure to prevent removal of the solution and too much wear on the stylus anode covering.

D. Use a back and forth or circular motion of the anode while plating, as shown. Do not change the direction of the anode while on the area to be plated, because that will burn the area. Change the direction of the anode only when the anode is on the mask and completely clear of the plating area, as shown. Move the anode at a constant rate of speed. Use an anode to cathode speed of 20 to 80 feet per minute (4 to 16 inches per second). Slower speeds can cause burns. For plating the ID or OD of cylindrical parts with a variable speed turning head or anode rotating tool, change the anode to cathode speeds equivalent to rpms. RPM = speed (ft/min) divided by circumference (ft).

E. Keep the anode fully wet with plating solution. Apply more solution or change the anode as necessary to supply sufficient solution for satisfactory plating.

F. Stylus cadmium plate at 20 volts until you can see a layer of plating. Then decrease the voltage to 8-14 volts and continue for the calculated number of ampere-hours.

G. Do not mechanically or manually remove material from, polish, or brush the stylus plated areas.

H. Manually cold water rinse 0.5 to 5 minutes with clean water. Dry with cotton, cloths, or compressed air within 5 minutes.

I. For repair of damaged plating:

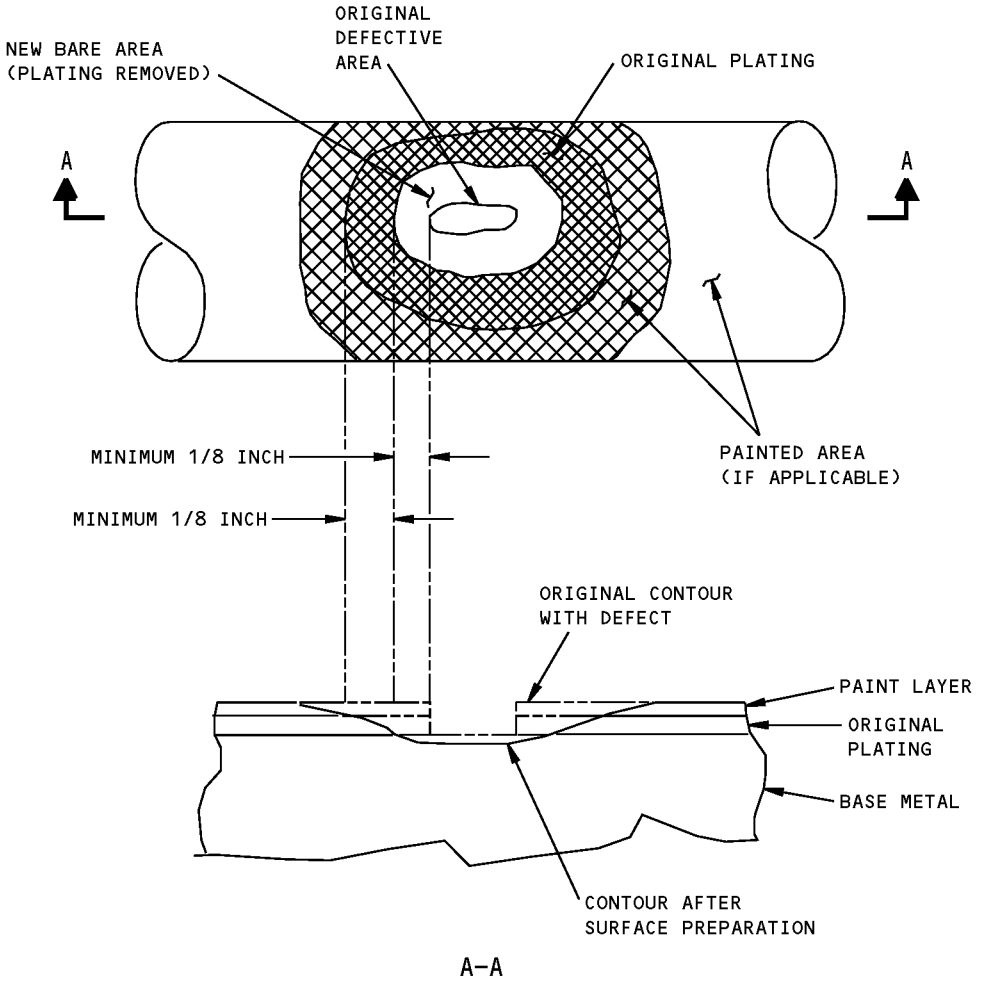
(1) Manually apply the chromate conversion coating by the manufacturer's instructions.

(2) Manually cold water rinse 0.5 to 5 minutes with clean water. To help dry the part, this can be followed by a hot water rinse at 150°F maximum.

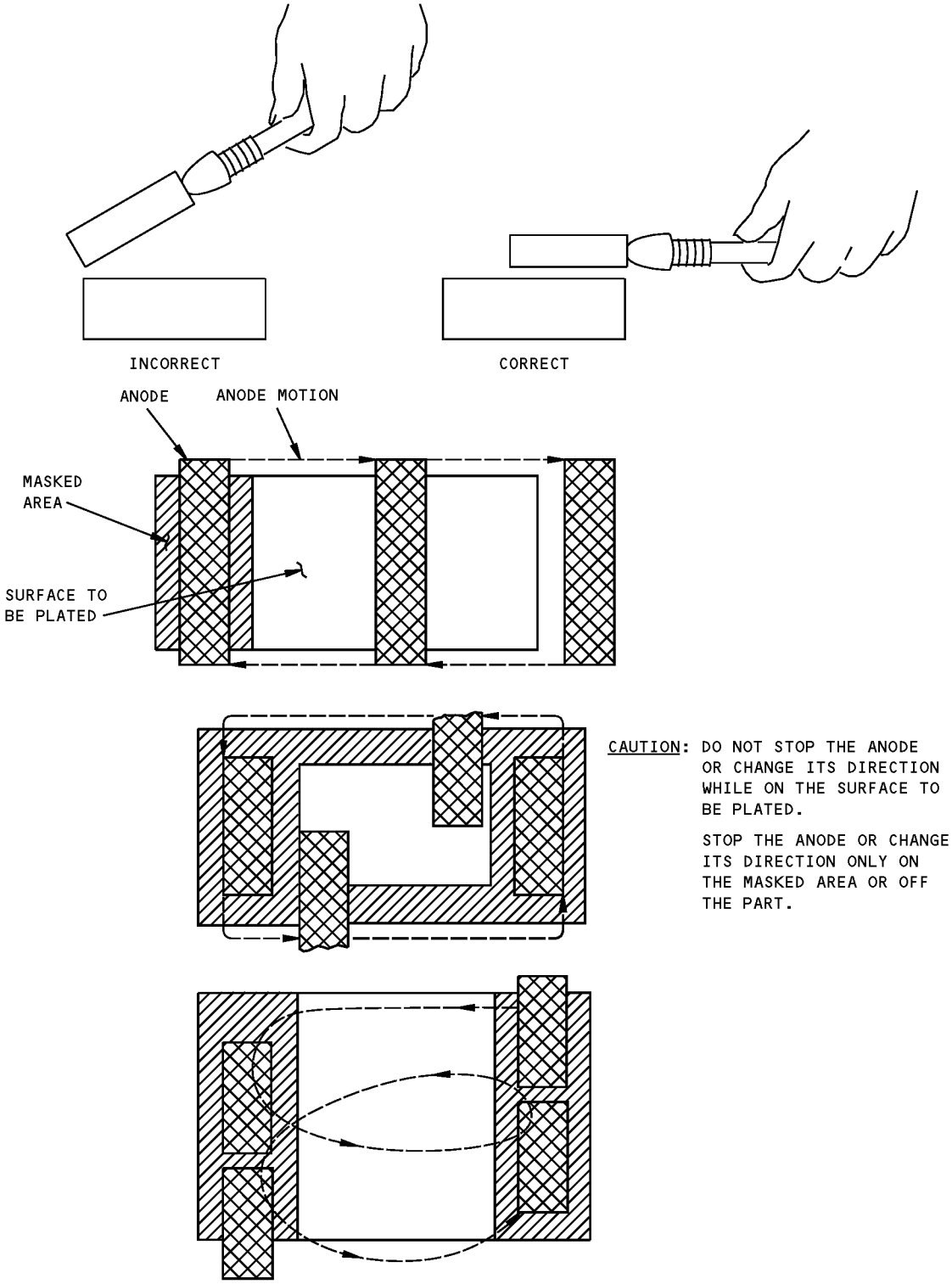
(3) Dry with cotton, cloths, or compressed air. Be careful, because the chromate coating is very soft.

J. Examine the quality of the plate.

K. If applicable, apply primer and enamel to the area.



Example Surface Preparation
Figure 3



EXAMPLE ANODE MOVEMENTS ACROSS SURFACES

How to Hold and Move the Anode During Plating
Figure 4

7. QUALITY CONTROL

A. The stylus plated layer must be smooth, fine-grained, have a good bond, and have no blisters, pits, modules, burns, or other defects.

B. The chromate conversion coating must be tightly bonded and have no powder.

C. There must be no sign of separation between stylus plating and the base metal, or between the stylus plating and a plating below it, when given this test:

(1) With strong fingertip pressure, apply pressure sensitive tape to the area.

(2) Hold a free end of the tape and pull suddenly in a direction perpendicular to the plated surface.

(3) Examine the adhesive side of the tape under 10-power magnification. There must be no cadmium plate.

D. Clean adhesive from the surface per SOPM 20-30-03.