

ELECTRICAL BONDING - MAINTENANCE PRACTICES

EFFECTIVITY: ALL

1. General

- A. This section gives the procedures to electrically bond/ground aircraft components and pieces of equipment to:
- (1) Protect the aircraft and personnel against lightning discharge hazards.
 - (2) Reduce electromagnetic interference in radio transmission and reception.
 - (3) Prevent the buildup of static charges between parts of the aircraft structure.
 - (4) Make power current return paths.
 - (5) Prevent development of RF potentials.
 - (6) Protect persons against shock hazards.
 - (7) Make fault current return paths.
- B. The procedures in this section are given in the sequence below. The tasks identified with (◆) are part of the Scheduled Maintenance Requirements Document (SMRD).

TASK NUMBER	DESCRIPTION	EFFECTIVITY
20-13-21-210-801-A	ELECTRICAL BONDING MAP - STANDARD PROCEDURES	ALL
20-13-21-700-801-A	ELECTRICAL BONDING TEST - STANDARD PROCEDURES	ALL
20-13-21-910-801-A	TYPES OF ELECTRICAL BONDING AND SURFACE PREPARATION - STANDARD PROCEDURES	ALL
20-13-21-910-802-A	ELECTRICAL BONDING PROTECTION - STANDARD PROCEDURES	ALL

TASK 20-13-21-210-801-A

EFFECTIVITY: ALL

2. ELECTRICAL BONDING MAP - STANDARD PROCEDURES

A. General

- (1) This task gives the procedure to identify the primary bonding jumpers and doors bonding jumpers on the aircraft.
- (2) The bonding jumpers are used as a very low resistance path for the current, from one part of the aircraft structure to another. They protect the aircraft against direct and indirect effects of lightning strike, EMI and ESD.
- (3) The bonding jumpers are installed on doors, fairings access doors and panels, flight control surfaces, landing gear and other external surfaces on the aircraft.
- (4) Some bonding jumpers are required, but not essential for all flights. The aircraft can be dispatched without some of these bonding jumpers. In this case, follow the maintenance instructions on this task. These bonding jumpers are classified as:

NOTE: In case of pilot report about noise on radio communication, it is possible that one of the causes can be the the damaged bonding jumper.

Table 201

GROUP	BONDING CLASS	REDUNDANCY	POSSIBLE CONSEQUENCES
TYPE 1	L: Lightning S: Eletrostatic discharge	Yes	1) Skin / Wire mesh damage that does not have effect on flight control capabilities due to lightning strikes, caused by magnetic forces or resistive heating; 2) VHF noise, due to P-static.
TYPE 2	L: Lightning S: Eletrostatic discharge	No	1) Localized damage due to lightning strikes that does not have effect on the aircraft operational capability, caused by magnetic forces or resistive heating; 2) VHF noise, due to P-static.
TYPE 3	S: Eletrostatic discharge	No	1) VHF noise, due to P-static.
TYPE 4	L: Lightning	No	1) Minor damage due to lightning strikes that does not have effect on the operational characteristic of Pax and Service doors, caused by magnetic forces or resistive heating; 2) VHF noise, due to P-static.
TYPE 5	L: Lightning	No	1) Damage due to lightning strikes, caused by magnetic forces or resistive heating; 2) VHF noise, due to P-static.

- (5) The other bonding jumpers shown in this task are mandatory primary bonding jumpers. They are very important for aircraft operation, and no damage is permitted to them.

- (6) A damage bonding jumper is:
- a missing bonding jumper;
 - a bonding jumper that is incorrectly attached;
 - a broken bonding jumper;
 - a bonding jumper with more than 25% of the bonding strands damaged. This value is 1/4 of the bonding jumper section.
- (7) For damaged bonding jumpers in other locations not illustrated in this task, call Embraer Technical Support to receive proper orientation.

B. References

REFERENCE	DESIGNATION
S.B.145-32-0036	-
SB145-32-0036	-

C. Zones and Accesses

Not Applicable

D. Tools and Equipment

Not Applicable

E. Auxiliary Items

Not Applicable

F. Consumable Materials

Not Applicable

G. Expandable Parts

Not Applicable

H. Persons Recommended

QTY	FUNCTION	PLACE
1	Does the task	Where applicable

I. Preparation

SUBTASK 841-006-A

WARNING: MAKE SURE THAT THE AIRCRAFT IS IN A SAFE CONDITION BEFORE YOU DO THE MAINTENANCE PROCEDURES. THIS IS TO PREVENT INJURY TO PERSONS AND/OR DAMAGE TO THE EQUIPMENT.

- (1) Do the procedure to make the aircraft safe for maintenance (TASK 20-00-00-910-801-A).
- (2) On aircraft PRE-MOD [S.B.145-32-0036](#), make sure that the pressure in hydraulic system 1 is fully released (TASK 29-10-00-860-802-A).

- (3) On aircraft POST-MOD [S.B.145-32-0036](#), install the safety pin of the NLG-door solenoid valve (TASK 32-00-02-910-801-A).
- (4) Put a "DO-NOT-OPERATE-THE-FLIGHT-CONTROLS" warning tag at the control wheels and control pedestal in the cockpit.
- (5) Put the hydraulic platform in the correct position and at the necessary height.
- (6) Get access to the area where the bonding jumpers are installed.
- (7) Make sure that the areas where you will do the inspections are clean. If not, clean the bonding jumpers with a lint-free wiper cloth moist with alcohol TT-I-735.

J. Electrical Bonding Map (Figure 201)

SUBTASK 210-003-A

- (1) Do the inspection of the bonding jumpers for signs of damage.
- (2) It is recommended to replace the damaged bonding jumpers you find.
- (3) To replace the bonding jumper, refer to the AMM task related to the component where you will install the bonding jumper as applicable. Make sure that you follow the steps below:
 - (a) Do the bonding procedure, method 7 (TASK 20-13-21-910-801-A).
 - (b) Do the bonding test (TASK 20-13-21-720-801-A).
 - (c) Do the bonding protection (TASK 20-13-21-910-802-A).
- (4) If the operator cannot replace the bonding jumper immediately, do as follows:
 - (a) For bonding jumpers identified as TYPE 1 group:
 - 1 It is allowed to dispatch the aircraft with a damaged bonding jumper if there is a minimum one serviceable bonding jumper installed in the group.

NOTE:

 - The bonding jumper is considered serviceable if less than 25% of the bonding strands are damaged. This value is 1/4 of the bonding jumper section.
 - The bonding jumpers (TYPE 1) installed in the component are divided into groups. The bonding jumpers in the same group are identified with each of the flags in the figures.
 - a Make an entry in the aircraft technical logbook to show that there is a damaged bonding jumper.
 - b Daily check the area to make sure that a minimum of one bonding jumper is serviceable in the component.
 - c Replace the damaged bonding jumper within the next 100 Flight Cycles.
 - (b) For bonding jumpers identified as TYPE 2, TYPE 3 or TYPE 4:

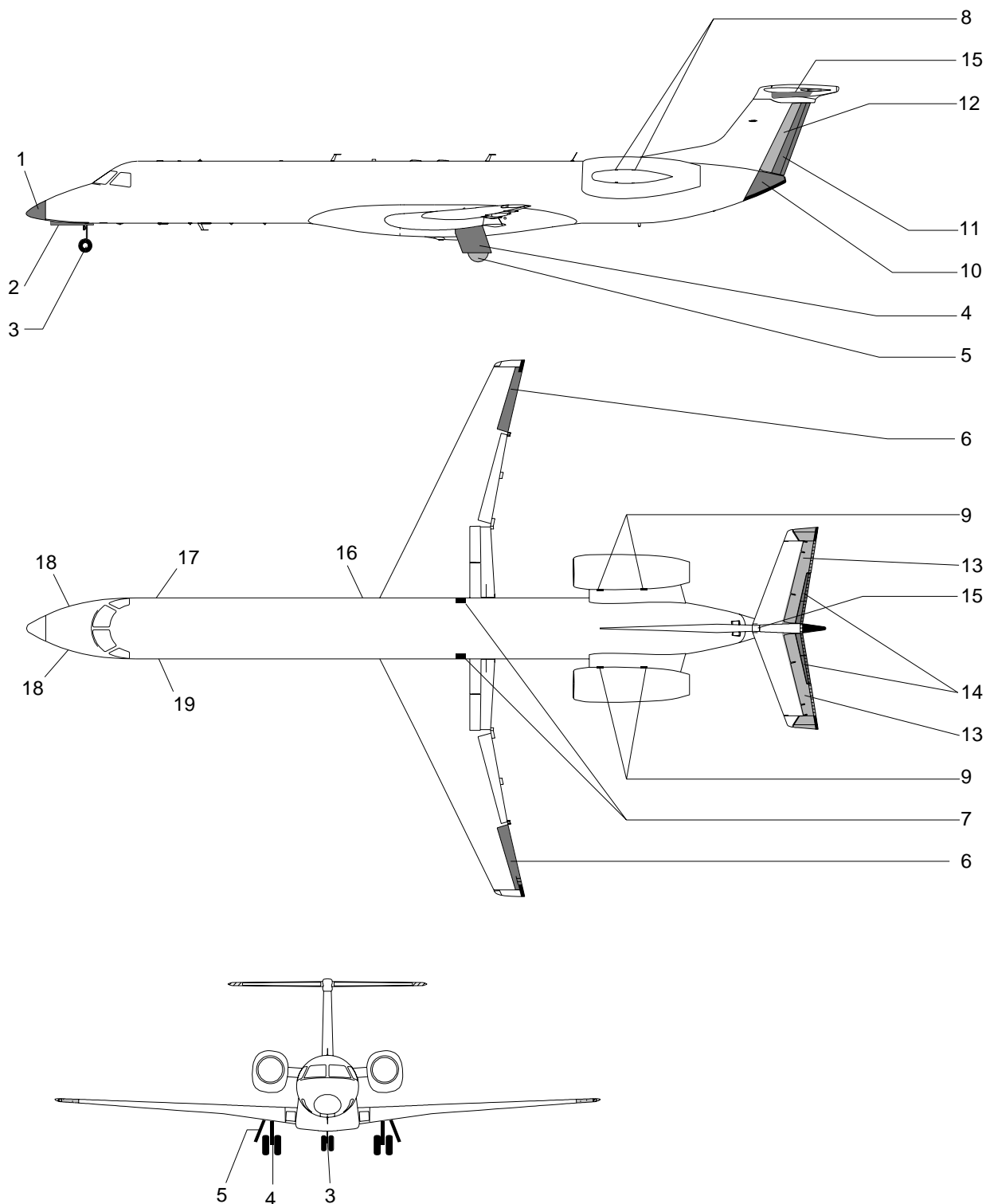
- 1 It is allowed to dispatch the aircraft with a damaged bonding jumper:
 - a Make an entry in the aircraft technical logbook to show that there is a damaged bonding jumper.
 - b Replace the damaged bonding jumper within the next 20 Flight Cycles.
- (c) For bonding jumpers identified as TYPE 5:
 - 1 It is allowed to dispatch the aircraft with a damaged bonding jumper provided the aircraft does not operate in known or forecast areas of convective activity:
 - a Make an entry in the aircraft technical logbook to show that there is a damaged bonding jumper and aircraft can not flight in known or forecast areas of convective activity .
 - b Replace the damaged bonding jumper within the next 10 Flight Cycles or next overnight, whichever occurs first.

K. Follow On

SUBTASK 841-007-A

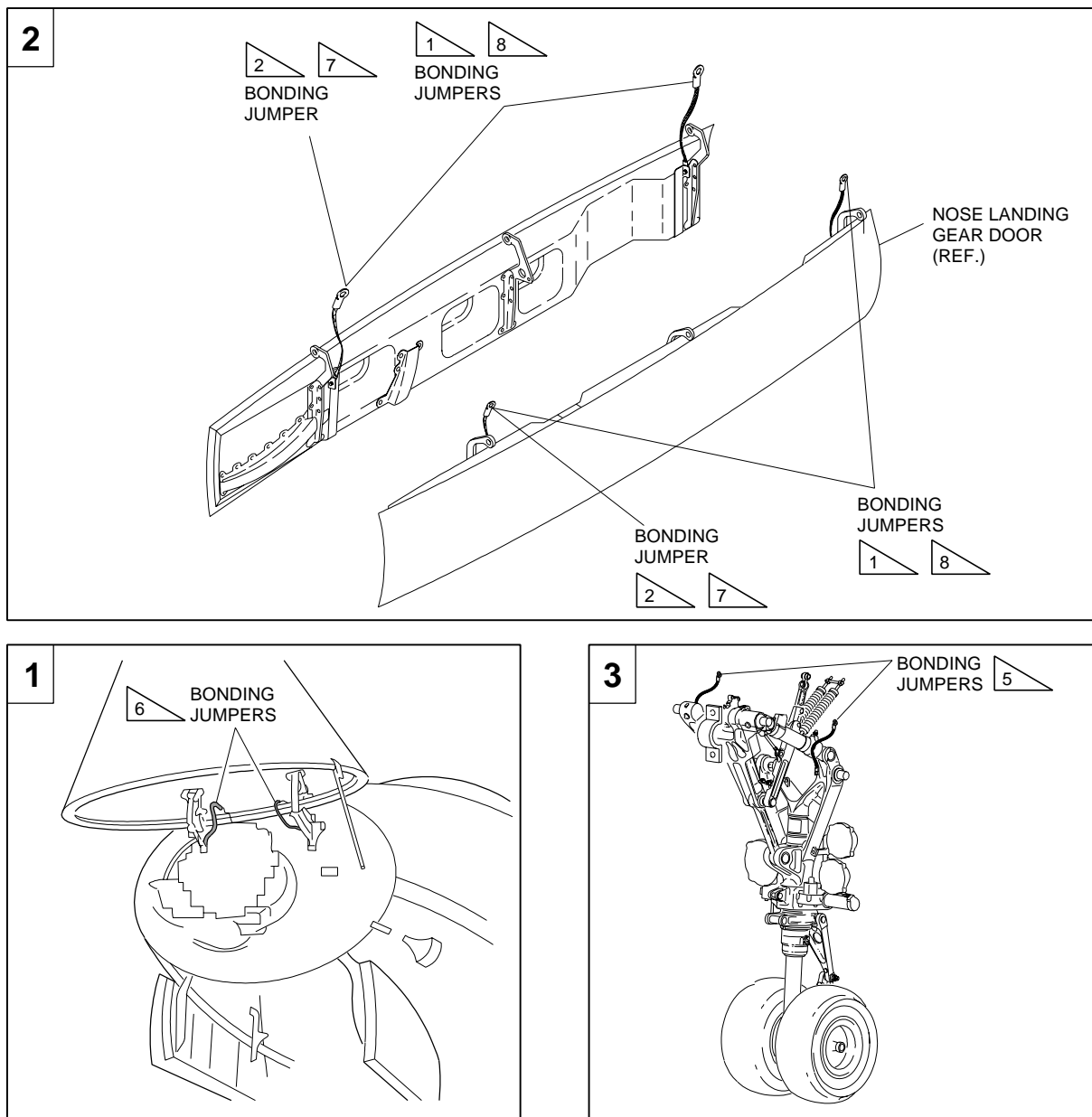
- (1) On aircraft POST-MOD [SB145-32-0036](#), remove the safety pin of the NLG-door solenoid valve (TASK 32-00-02-910-801-A).
- (2) Remove the "DO-NOT-OPERATE-THE-FLIGHT-CONTROLS" tag from the cockpit.
- (3) Remove the hydraulic platform.
- (4) Put the aircraft back to its initial condition (TASK 20-00-00-910-801-A).

EFFECTIVITY: ALL
Electrical Bonding Map
Figure 201 - Sheet 1



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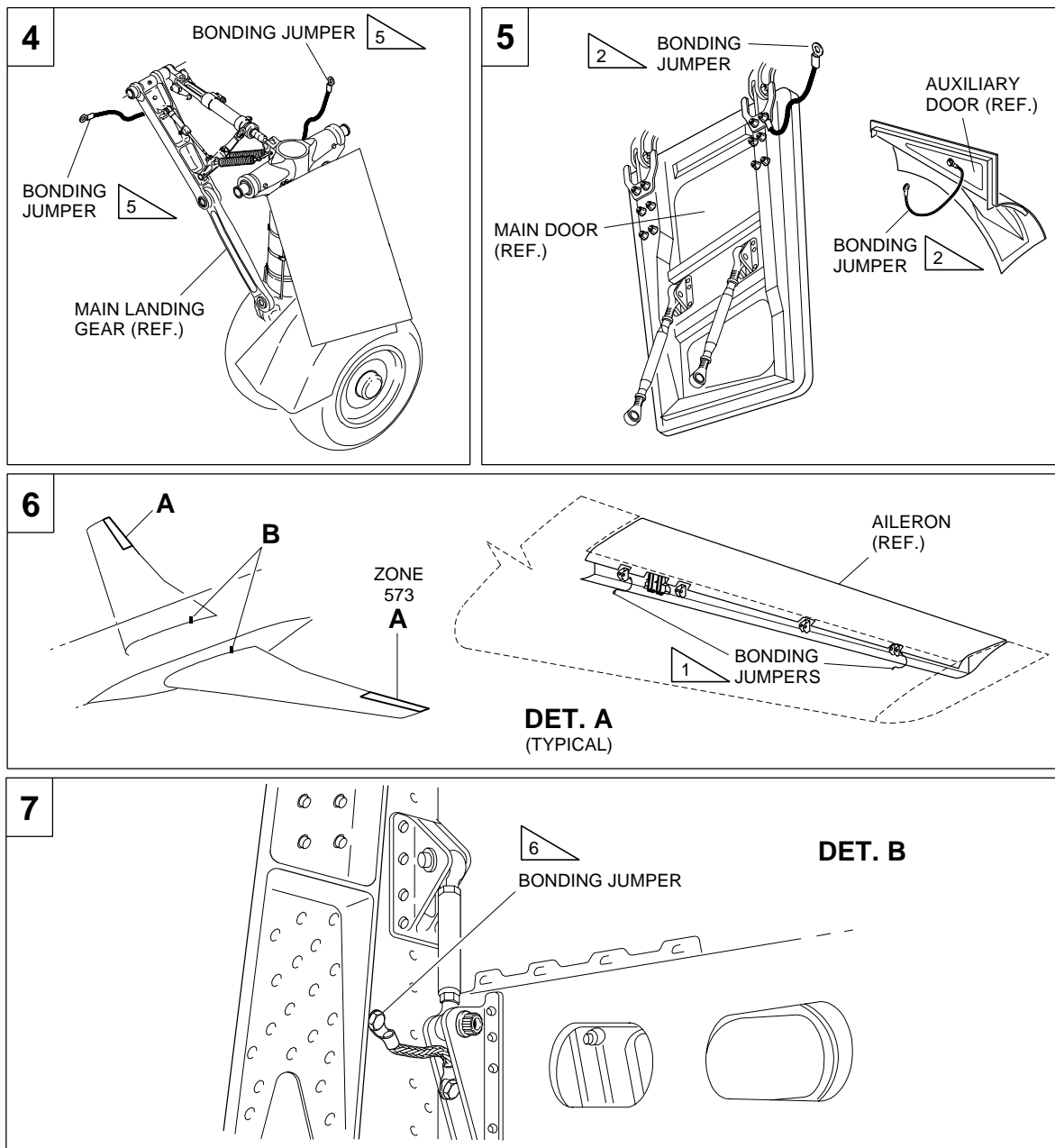
EFFECTIVITY: ALL
 Electrical Bonding Map
 Figure 201 - Sheet 2



- | | |
|---|--|
| <p>1 TYPE 1 GROUP: A MINIMUM OF ONE BONDING JUMPER IN THE GROUP MUST BE IN SERVICEABLE CONDITION.</p> <p>2 TYPE 2</p> <p>3 TYPE 3</p> <p>4 TYPE 4</p> <p>5 TYPE 5</p> | <p>6 MANDATORY PRIMARY BONDING JUMPER</p> <p>7 PRE-MOD 145-52-0042</p> <p>8 POST-MOD 145-52-0042</p> |
|---|--|

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EFFECTIVITY: ALL
 Electrical Bonding Map
 Figure 201 - Sheet 3



1 TYPE 1 GROUP: A MINIMUM OF ONE BONDING JUMPER IN THE GROUP MUST BE IN SERVICEABLE CONDITION.

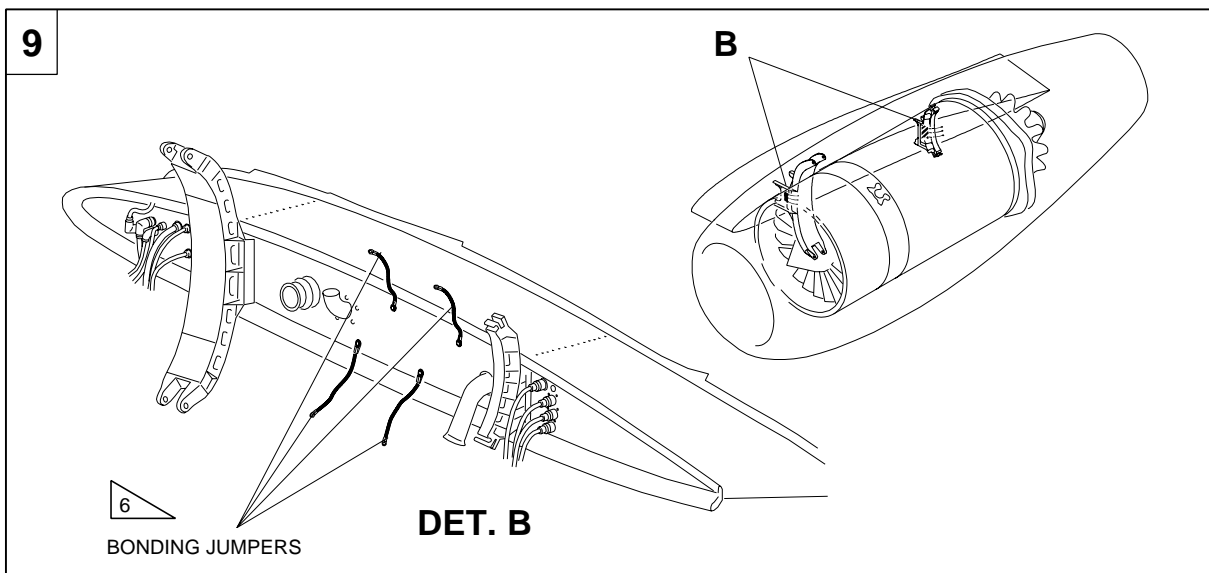
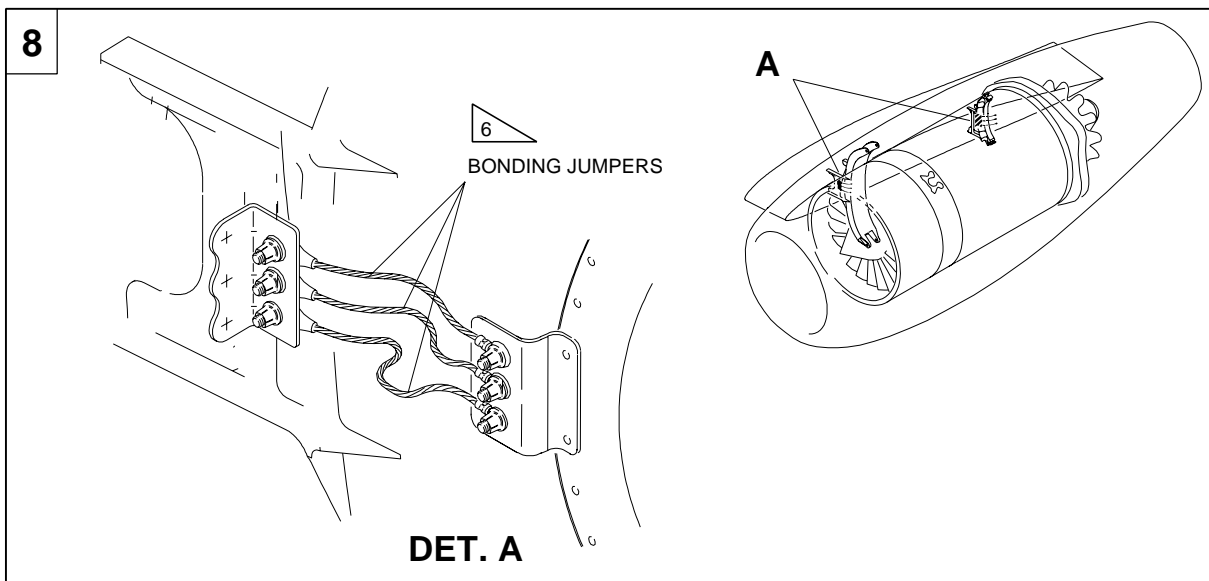
2 TYPE 2

5 TYPE 5

6 MANDATORY PRIMARY BONDING JUMPER

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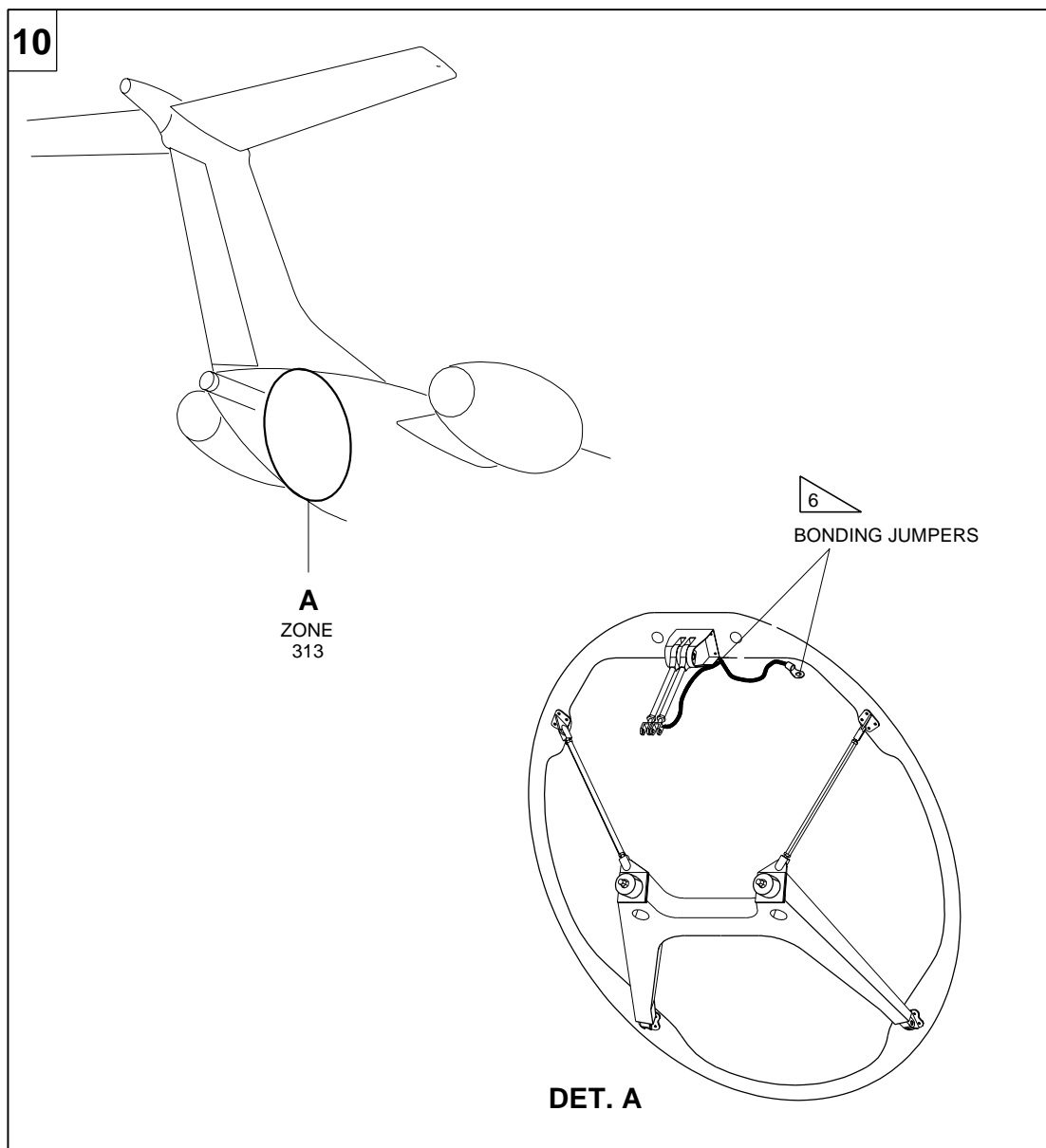
EFFECTIVITY: ALL
 Electrical Bonding Map
 Figure 201 - Sheet 4



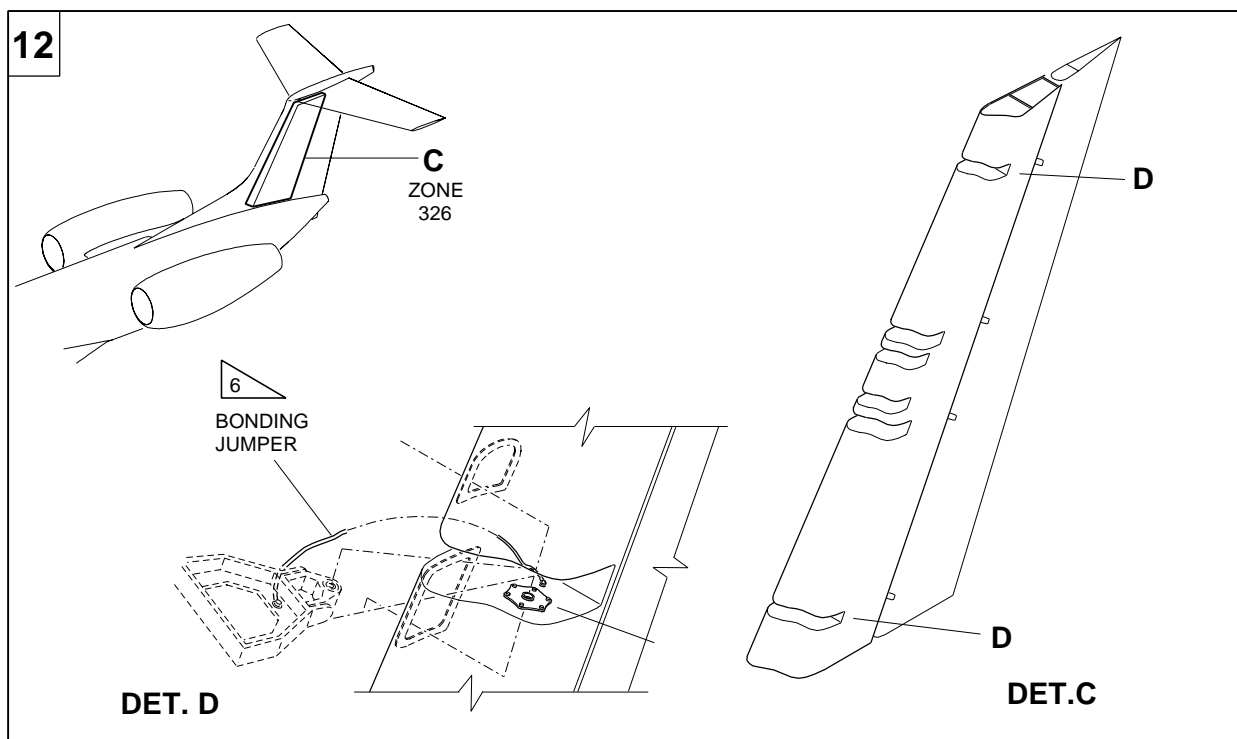
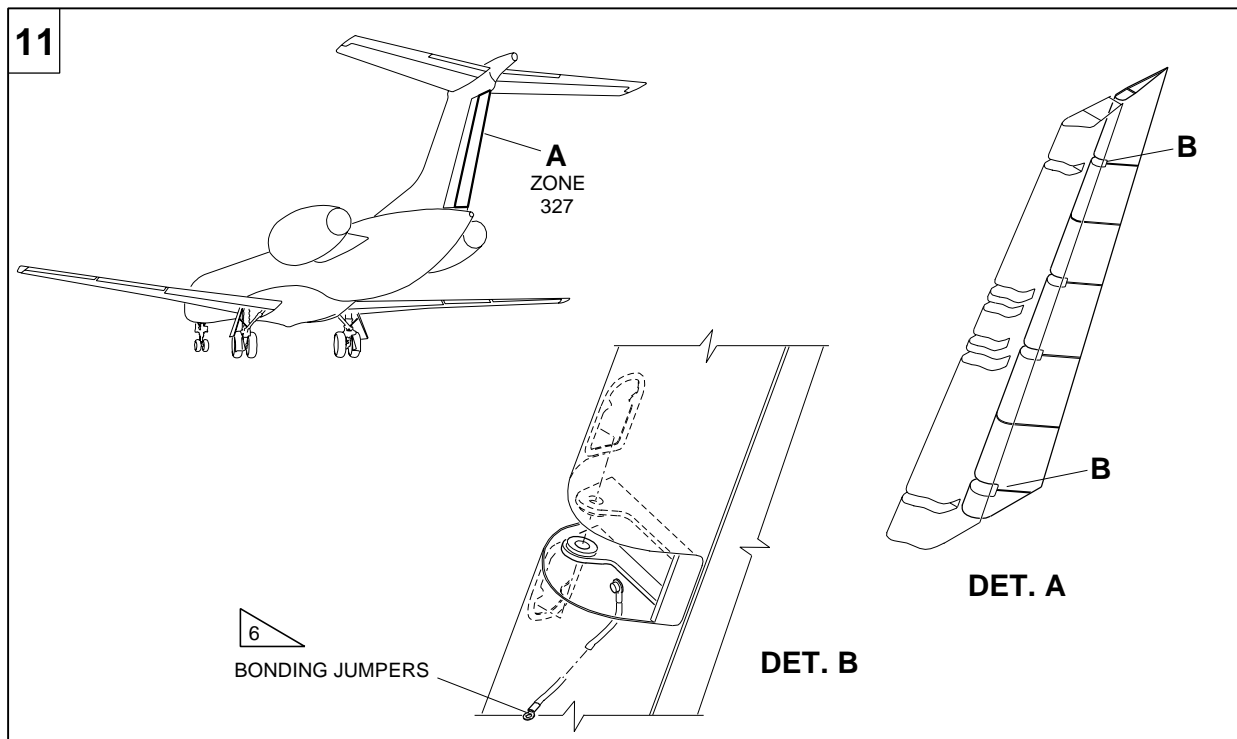

MANDATORY PRIMARY BONDING JUMPER

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EFFECTIVITY: ALL
 Electrical Bonding Map
 Figure 201 - Sheet 5



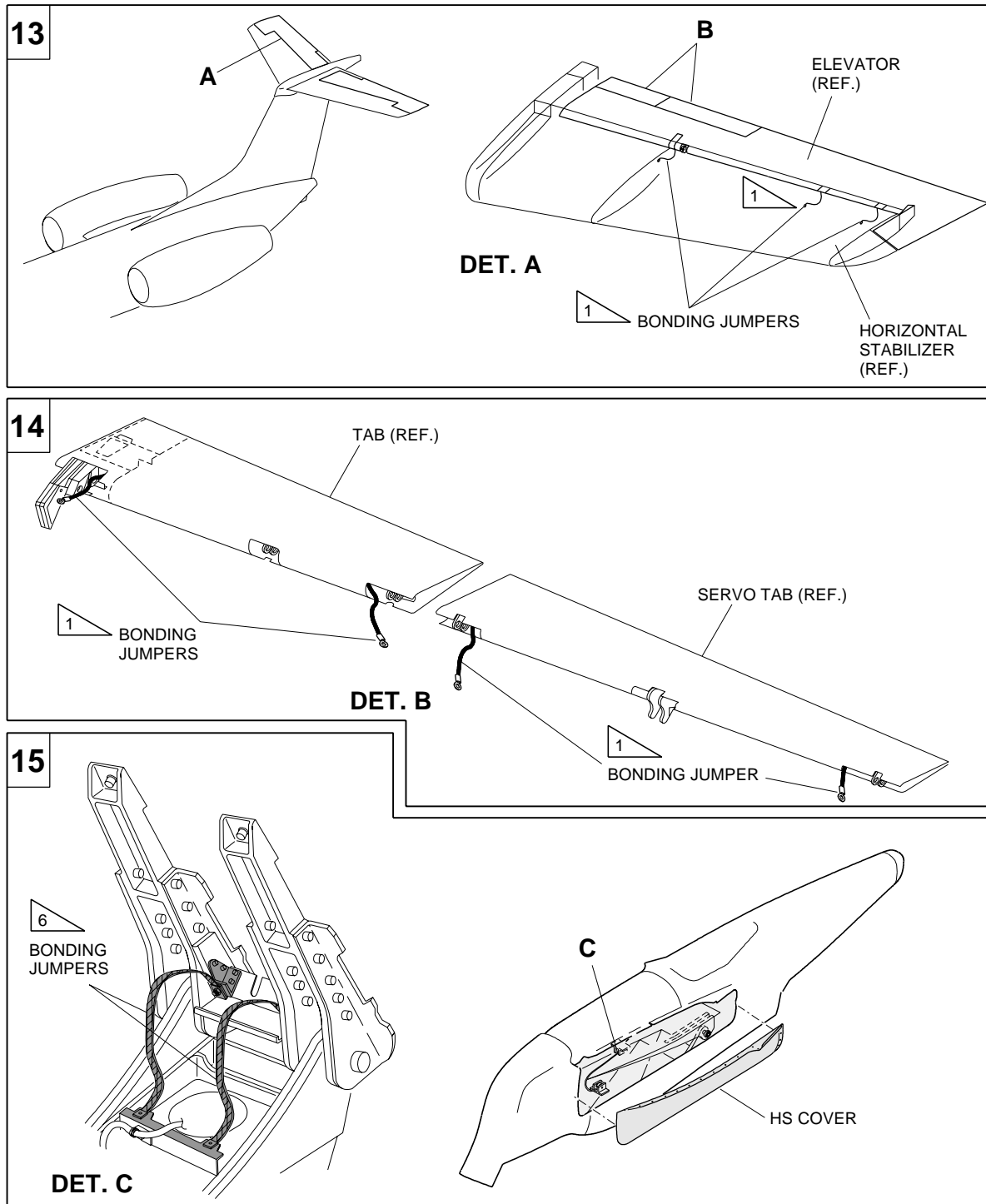
EFFECTIVITY: ALL
Electrical Bonding Map
Figure 201 - Sheet 6



6 MANDATORY PRIMARY BONDING JUMPER

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EFFECTIVITY: ALL
Electrical Bonding Map
Figure 201 - Sheet 7

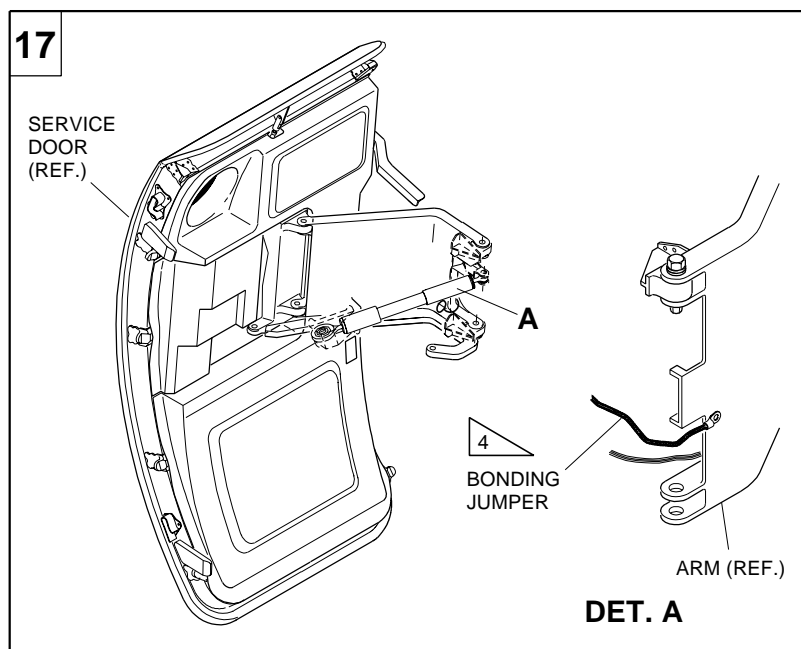
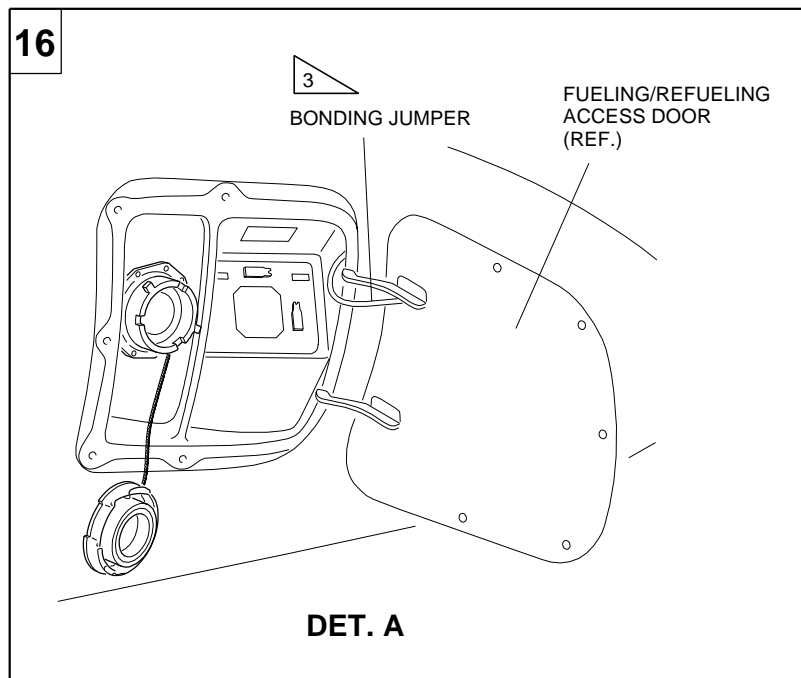


1 TYPE 1 GROUP: A MINIMUM OF ONE BONDING JUMPER IN THE GROUP MUST BE IN SERVICEABLE CONDITION.

6 MANDATORY PRIMARY BONDING JUMPER

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EFFECTIVITY: ALL
 Electrical Bonding Map
 Figure 201 - Sheet 8

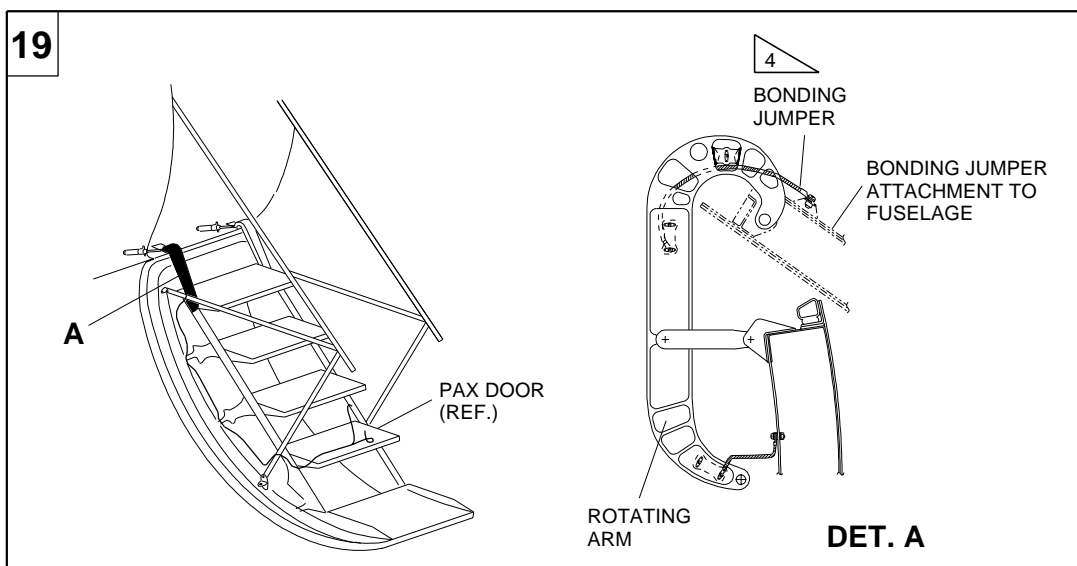
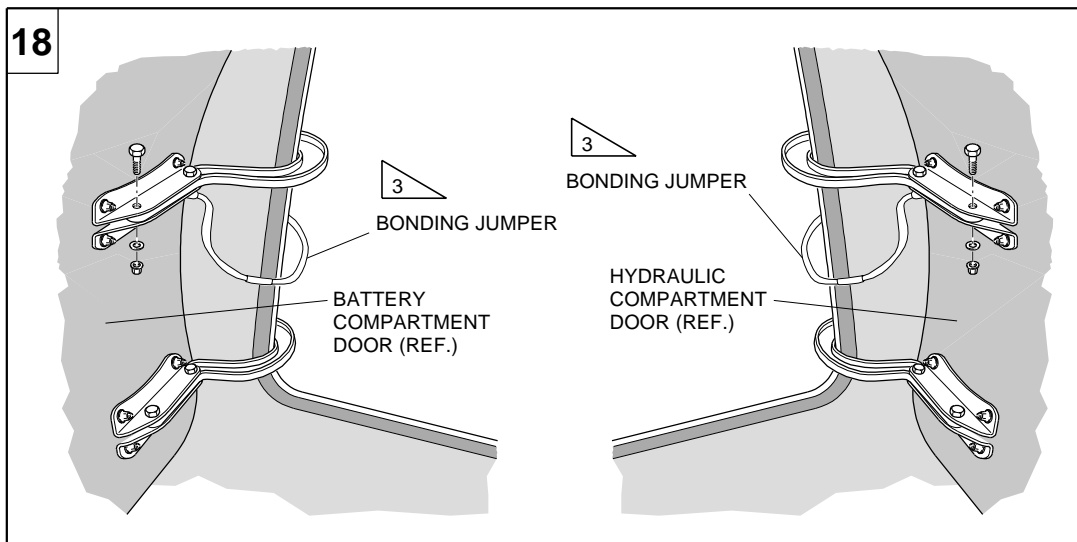


3 TYPE 3

4 TYPE 4

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EFFECTIVITY: ALL
 Electrical Bonding Map
 Figure 201 - Sheet 9



 TYPE 3

 TYPE 4

EM145AMM200127A.DGN

TASK 20-13-21-700-801-A

EFFECTIVITY: ALL

3. ELECTRICAL BONDING TEST - STANDARD PROCEDURES

A. General

- (1) This task gives the electrical-bonding test procedure.
- (2) There are two ground points. Use the ground point that is nearest to the necessary test point.
- (3) An electrical/avionics-systems maintenance technician is necessary to do this task.

B. References

REFERENCE	DESIGNATION
AMM MPP 06-41-01/100	-
AMM MPP 20-13-21/200	- MAINTENANCE PRACTICES
AMM MPP 28-00-00/200	- MAINTENANCE PRACTICES
AMM TASK 20-40-01-860-801-A/200	ENERGIZATION OF THE AIRCRAFT WITH AN EXTERNAL POWER SOURCE

C. Zones and Accesses

ZONE	PANEL/DOOR	LOCATION
113	113DL	Battery Compartment
312	312AR	Tail Cone Door

D. Tools and Equipment

ITEM	DESCRIPTION	PURPOSE	QTY
GSE 567	Portable Milliohm-meter or similar	To measure the electrical resistance	
GSE 045	Milliohm-meter	(alternative to GSE 567)	
GSE 425	M1 Milliohm-meter	To measure the low electrical resistance	

E. Auxiliary Items

Not Applicable

F. Consumable Materials

Not Applicable

G. Expandable Parts

Not Applicable

H. Persons Recommended

QTY	FUNCTION	PLACE
1	Does the task	AR

I. Preparation (Figure 202) (Figure 203)

SUBTASK 841-002-A

WARNING: MAKE SURE THAT THE AIRCRAFT IS IN A SAFE CONDITION BEFORE YOU DO THE MAINTENANCE PROCEDURES. THIS IS TO PREVENT INJURY TO PERSONS AND/OR DAMAGE TO THE EQUIPMENT.

- (1) Make sure that the aircraft is safe for maintenance.
- (2) Do this task with the aid of a GSE 567 (or GSE 045), unless for fuel system components installed in the fuel tank.
- (3) For fuel-related components, do the procedure to make the aircraft safe for maintenance of the fuel system ([AMM MPP 28-00-00/200](#)).

WARNING: OBEY THE PURGING AND FUEL TANK ENTRY PRECAUTIONS TO PREVENT INJURY TO PERSONS OR DAMAGE TO EQUIPMENT ([AMM MPP 28-00-00/200](#)).

- (a) For components installed in the fuel tank, do the steps that follow:

WARNING: USE ONLY GSE 425 FOR THE ELECTRICAL BONDING CHECK. IF YOU USE A DIFFERENT GSE, A FIRE OR COMBUSTION CAN OCCUR.

- 1 Do this task with the aid of a GSE 425.
 - 2 Make sure that the aircraft is deenergized.
 - 3 Let an air flow through the tanks to decrease the concentration of fuel vapors.
 - 4 Keep the fuel-vapor concentration levels in the fuel tank below 10% lower explosion limits (LEL).
 - 5 Keep the oxygen levels in the fuel tanks between 19.5% and 23.5% by volume.
 - 6 Make sure that the point where you will do the test is dry.
- (4) Disconnect the external DC power supply from the aircraft ([AMM TASK 20-40-01-860-801-A/200](#)).
- (5) Get access to the point where you will do the test.
- (6) Use the ground bracket nearest to the point at which you will do the measurement.
- (7) If necessary, open access 113DL to use the ground point at the battery compartment AMM MPP 06-41-01/100.
- (8) If necessary, open access 312AR to use the ground point at the tail cone door AMM MPP 06-41-01/100.

J. Electrical Bonding Test

SUBTASK 720-002-A

CAUTION: MAKE SURE THAT THE POINT WHERE YOU WILL DO THE MEASUREMENT IS CLEAN. IF YOU PUT THE PROBE IN CONTACT WITH OIL, GREASE OR FUEL, DAMAGE TO THE EQUIPMENT OR A WRONG READING CAN OCCUR.

- (1) Connect the alligator clip ground probe of the Milliohmmeter to the nearest ground bracket.
- (2) With the GSE 567 (or GSE 045) alligator clip connected to the correct ground point, put the probe at the test point to measure the related resistance.

NOTE: When the test point is painted or has a different insulation, the probe must go through this cover and touch the metal before you can read the value on Milliohmmeter.

- (3) The maximum resistance value must be less than the value in [Table 202](#). If the resistance value is more than the value in [Table 202](#), do the corrective action [AMM MPP 20-13-21/200](#).

Table 202 - TEST POINTS - VALUES

CATEGORY	SUBDIVISIONS	VALUES (mΩ)
Structure	Between primary structures	0.1
	Between primary and secondary structures	2.5
	Between primary structure and electrically bonded brackets attached with rivets	0.5
	Between primary structure and electrically bonded brackets attached with bolts	2.5
Ground brackets	Battery, external power supply, generators	0.1
	Ground studs (GSs)	0.5
Grounding jacks	Wing grounding jacks	100
Main structural parts junction	Wing / fuselage, forward fuselage / center fuselage, center fuselage / rear fuselage, etc.	0.5
Tubes	Fuel	200
	Oxygen	100
	Pneumatic	200
	Hydraulic	200
	Pressurization	200
	Air conditioning	200
Refueling adapter	Refueling adapters	100
Electrical assemblies	LRUs (except for the Printer, Digital Clock and Steering Handwheel)	10
	Printer, Digital Clock and Steering Handwheel	100
	Trays	5.0
	Overbraided harnesses	10
	Connectors with tag ring, strain relief, back-shell	15
Mechanical assemblies	LRU	10
	Landing gear	10
	Actuators	10
Engines	Engine/structure	2.5
	Pylon/structure	0.5
APU	APU/structure	15
Doors / inspection windows	Metallic	25
	Composite	150
	Electro / electronic compartment doors	10
Antennas	Antennas (general)	2.5
	HF Antennas	50
Composite parts (with expanded metal foil)	Wing - fuselage fairing	50
	Elevator fairing	50
	Wing tip	50

Table 202 - TEST POINTS - VALUES (Continued)

CATEGORY	SUBDIVISIONS		VALUES (mΩ)
	Vertical Stabilizer Tip Fairing		150
	Panels		150
	Console		150
Radome	Diverters		10
Control surfaces (ailerons, elevators, speed brakes, rudder, slats, spoilers, tabs)	Metallic	Electrical bonding with rollers	15
		Others	5
	Composite		50

K. Follow-on [\(Figure 202\)](#) [\(Figure 203\)](#)

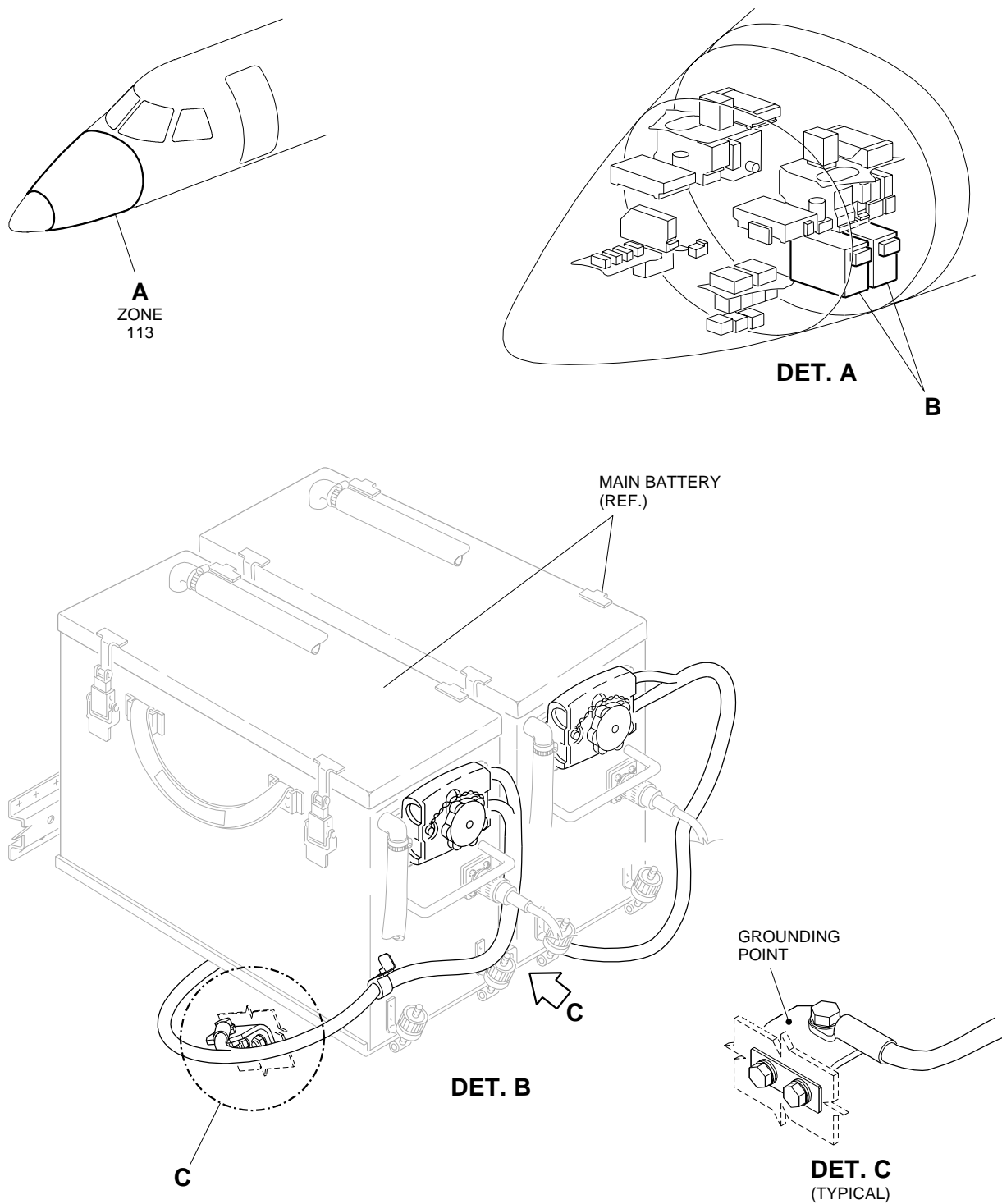
SUBTASK 841-003-A

- (1) If applicable, close access 113DL (ground point at the battery compartment) AMM MPP 06-41-01/100.
- (2) If applicable, close access 312AR (ground point at the tail cone door) AMM MPP 06-41-01/100.
- (3) If necessary, repair the paint or insulation of the related test points. Refer to CPM - Corrosion Prevention Manual - Chapter 51.
- (4) Put the aircraft back to its initial condition.

EFFECTIVITY: ALL

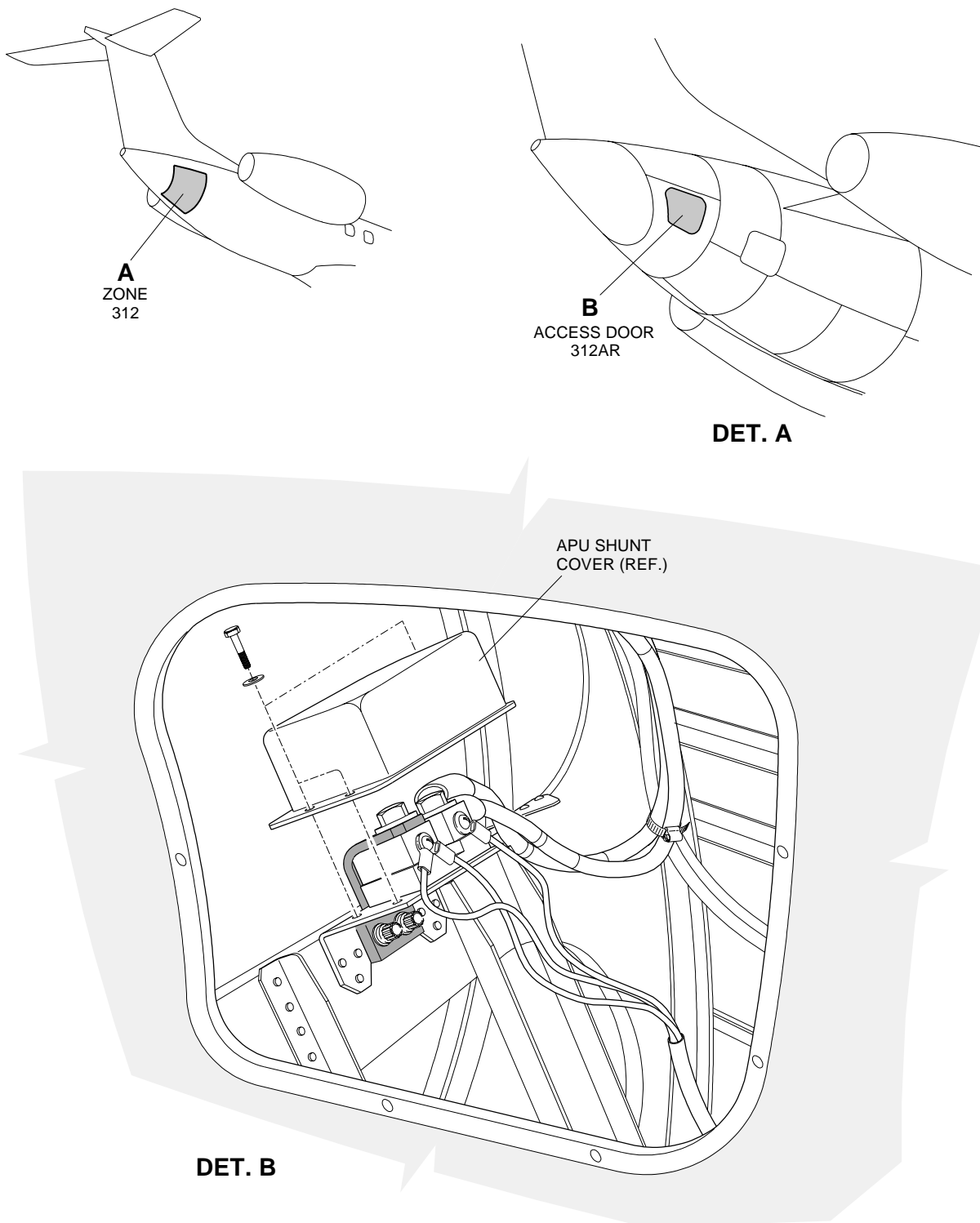
Ground Point at the Battery Compartment

Figure 202



EM145AMM200070A.DGN

EFFECTIVITY: ALL
Ground Point at the Tail Cone
Figure 203



EM145AMM200072A.DGN

TASK 20-13-21-910-801-A

EFFECTIVITY: ALL

4. TYPES OF ELECTRICAL BONDING AND SURFACE PREPARATION - STANDARD PROCEDURES

A. General

- (1) This task gives the procedure to prepare surfaces for electrical bonding and the description of the bonding methods.
- (2) Electrical/Avionics Systems maintenance technician is necessary to do this task.

B. References

REFERENCE	DESIGNATION
AMM MPP 23-60-00/500	- ADJUSTMENT/TEST
AMM MPP 23-60-00/600	- INSPECTION/CHECK
AMM MPP 23-60-01/400	- REMOVAL/INSTALLATION
WM 20-30-00/201	-

C. Zones and Accesses

Not Applicable

D. Tools and Equipment

ITEM	DESCRIPTION	PURPOSE	QTY
Commercially Materials	Polyethylene spatula	To clean areas to be bonded	

E. Auxiliary Items

Not Applicable

F. Consumable Materials

SPECIFICATION (BRAND)	DESCRIPTION	QTY
MIL-C-5541	Chemical-Conversion Compound, Alodyne 1200S	AR
MEP 09-075	Corrosion Inhibitive Compound, COR-BAN 27L	AR
MEP 13-073	Solvent for Manual Cleaning, RHODIASOLVE E-23	AR
-	Scotch Brite Sponge, Type A	AR

G. Expandable Parts

Not Applicable

H. Persons Recommended

QTY	FUNCTION	PLACE
1	Does the task	AR

I. Surfaces for Electrical Bonding - Preparation

SUBTASK 910-002-A

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCOHOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

CAUTION: DO NOT PUT CLEANING CLOTHS, BRUSH, OR SPONGES INTO SOLVENT CONTAINER TO PREVENT SOLVENT CONTAMINATION. CONTAMINATED SOLVENT CAN CAUSE DAMAGE TO THE EQUIPMENT.

- (1) After you clean the parts which you will bond, keep them away from oil and greases.
- (2) If there is sealant on the surfaces which you will bond, remove it. Use a polyethylene spatula, if necessary.
- (3) You must use the material that is specified in the IPC or in the SRM.
- (4) To do the bonding procedure, it is necessary to know the correct bonding method. The installation task gives the applicable bonding method and the table that follows lists all methods:

Table 203 - BONDING METHODS

METHOD	DESCRIPTION
1	Soldering
3	Bolts/screws, pins and nuts
4	Metal blades (straps)
5	Rivets
6	Brackets and metal clamps
7	Bonding jumpers
8	Static dischargers
9	Grounding modules
10	Palmer bonding (brackets, bonding jumpers, and grommets)
11	Tubular braid (electrical wiring)
12	Antenna base that touches the skin
13	Connectors bonding to structural surface
15	Electrical bonding of metal-to-metal structures

J. Bonding Methods - Description

SUBTASK 910-003-A

- (1) The bonding application and the methods are as follows:

Table 204 - BONDING APPLICATION AND METHODS

ITEMS	APPLICATION	METHODS
Electrical / Electronic Equipment	Current path return	1, 3, 5, 7, 9, 10
	Shock hazard	1, 3, 4, 5, 6, 7
	RF potentials	1, 3, 4, 6, 10, 13

Table 204 - BONDING APPLICATION AND METHODS (Continued)

ITEMS	APPLICATION	METHODS
Navigation Lights Fuel filter caps Fuel cage covers Vents Radome Pitot tubes Wiring not protected by metal or body structure Control surfaces Doors and windows Metal tubing Actuators	Lightning protection	1, 3, 4, 5, 6, 7, 11, 13
Oil, fuel, and anti-freezing fluid tanks Radiators Control surfaces Tubes with liquids and gases (except water and alcohol) Fairings Radome Landing gear Metal surfaces separated by nonconductive materials Metal surfaces separated by noncon- ductive materials	Static charge	1, 3, 4, 5, 6, 7, 8, 10, 11, 13
Antennas	Operational Lightning protection Static charge	12

(2) The steps that follow give the bonding methods:

- (a) Method 1: Soldering - applicable to all bonding classes. Refer to WM 20-30-00/201.
- (b) Method 3: Bolts/screws, pins and nuts - applicable to screws or bolts with self-locking nuts or nutplates. Refer to Figure 204 and Figure 205:
 - 1 With a SCOTCH BRITE TYPE A sponge, remove old Alodine from the structure which you will bond.
 - 2 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the faying surfaces between the structures or between the equipment and its support, as applicable. Before RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.
 - 3 Do a visual inspection on the faying surfaces to make sure that there is no corrosion.
 - 4 With a clean cloth soaked in solvent RHODIASOLVE E-23, clean the bolts, washers, nuts and pins, as applicable. Before RHODIASOLVE E-23 solvent evaporates, dry these materials with a clean dry cloth.

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCOHOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

- 5 With a soft-bristle brush, apply corrosion protective ALODINE 1200S solution to the aircraft structure which you prepared for bonding. Let the solution stay on the surfaces for two to three minutes. The surfaces will turn yellowish.

NOTE: The pot life of the Alodine corrosion-protective ALODINE 1200S solution is 24 hours.

- 6 With a clean cloth soaked in water, clean the alodized area a minimum of three times. Be careful not to cause damage to the corrosion protective ALODINE 1200S film.

- 7 Let the surfaces dry in the air.

NOTE: Do not touch the surfaces after you clean them.

- 8 Do the bonding immediately.

- (c) Method 4: Metal blades - applicable to the bonding of set of tubes and pieces of equipment to prevent problems caused by electromagnetic interferences (RF signals, for example). Refer to Figure 206 and Figure 207.

- 1 For bonding with metal blade-lined clamping blocks (Figure 206):

- a With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the faying surfaces between the tubes and their supports. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.
- b Do a visual inspection on the faying surfaces to make sure that there is no corrosion.
- c With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the bolts, washers, nuts, and pins, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these items with a clean dry cloth.

NOTE: Do not touch the surfaces after you clean them.

- d Do the bonding immediately.

- 2 For bonding equipment with metal blades (Figure 207):

- a With a SCOTCH BRITE TYPE A sponge, remove the old Alodine from the structure which you will bond.
- b With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the faying surfaces between the equipment and the metal blade and between the metal blade and its support. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.

- c Do a visual inspection on the faying surfaces to make sure that there is no corrosion.
- d With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the bolts, washers, and nuts, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these items with a clean dry cloth.

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCOHOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

- e With a soft-bristle brush, apply corrosion-protective ALODINE 1200S solution to the aircraft structure which you prepared for bonding. Let the solution stay on the surfaces for two to three minutes. The surfaces will turn yellowish.

NOTE: The pot life of the corrosion-protective ALODINE 1200S solution is 24 hours.

- f With a clean cloth soaked in water, clean the alodized area a minimum of three times. Be careful not to cause damage to the corrosion-protective Alodine 1200S film.
- g Let the surfaces dry in the air.

NOTE: Do not touch the surfaces after you clean them.

- h Do the bonding immediately.

- (d) Method 5: Rivets - applicable to structure-to-structure bonding. Refer to Figure 208.

- 1 With a clean cloth soaked in solvent RHODIASOLVE E-23, clean the faying surfaces between the structures. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.
- 2 Do a visual inspection of the faying surfaces to make sure that there is no corrosion.
- 3 With a clean cloth soaked in solvent RHODIASOLVE E-23, clean the rivets. Before the RHODIASOLVE E-23 solvent evaporates, dry the rivets with a clean dry cloth.

NOTE: Do not touch the surfaces after you clean them.

- 4 Do the bonding immediately.

- (e) Method 6: Brackets and metal clamps - applicable to bonding of tubes with clamps. Refer to Figure 209, Figure 210, Figure 211, Figure 212, and Figure 213.

- 1 For anodized bracket that touches an anodized structure (Figure 209):

- a With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the faying surfaces between the structures and brackets. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.
 - b Do a visual inspection on the faying surfaces to make sure that there is no corrosion.
 - c With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the rivets, bolts, washers, nuts, and shims, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these items with a clean dry cloth.
 - d Do the bonding immediately.
- 2 For bonding with a support connected to the structure and direct bonding of the structure with a clamp (Figure 210):
- a With a SCOTCH BRITE TYPE A sponge, remove the old Alodine from the structure which you will bond.
 - b With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the faying surfaces between the bracket and the structure and between the clamp and its support, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.
 - c Do a visual inspection on the faying surfaces to make sure that there is no corrosion.
 - d With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the bolts, washers, and nuts, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these items with a clean dry cloth.

NOTE: Do not touch the surfaces after you clean them.

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCOHOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

- e With a soft-bristle brush, apply corrosion-protective ALODINE 1200S solution to the aircraft structure which you prepared for bonding. Let the solution stay on the surfaces for two to three minutes. The surfaces will turn yellowish.

NOTE: The pot life of the corrosion-protective ALODINE 1200S solution is 24 hours.

- f With a clean cloth soaked in water, clean the alodized area a minimum of three times. Be careful not to cause damage to the corrosion-protective ALODINE 1200S film.
- g Let the surfaces dry in the air.

NOTE: Do not touch the surfaces after you clean them.

h Do the bonding immediately.

3 For bonding of the structure and metal tubing with a jumper (Figure 211), (Figure 212), and (Figure 213):

a With a SCOTCH BRITE TYPE A sponge, remove the old Alodine from the structure which you will bond, if applicable.

b With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the faying surfaces between the clamp and the tube and between the clamp and the jumper terminals, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.

c Do a visual inspection on the faying surfaces to make sure that there is no corrosion.

d With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the bolts, washers, and nuts, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these items with a clean dry cloth.

e For tubes that have a protection cover and were prepared for bonding:

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCO-HOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

1) With a soft-bristle brush, apply corrosion-protective ALODINE 1200S solution to the tube surface which you prepared for bonding. Let the solution stay on the surfaces for two to three minutes. The surfaces will turn yellowish.

NOTE: The pot life of the corrosion-protective ALODINE 1200S solution is 24 hours.

2) With a clean cloth soaked in water, clean the alodized area a minimum of three times. Be careful not to cause damage to the corrosion-protective ALODINE 1200S film.

3) Let the surfaces dry in the air.

4) Do the bonding immediately.

NOTE: Do not touch the surfaces after you clean them.

f Do the bonding immediately.

NOTE: Do not touch the surfaces after you clean them.

(f) Method 7: Bonding jumpers. Refer to Figure 214 and Figure 215.

1 With a SCOTCH BRITE TYPE A sponge, remove the old Alodine from the structure which you will bond.

- 2 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the faying surfaces between the jumper terminals and structure or equipment. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.
- 3 Do a visual inspection on the faying surfaces to make sure that there is no corrosion.
- 4 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the bolts, washers, and nuts, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these items with a clean dry cloth.

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCOHOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

- 5 With a soft-bristle brush, apply the corrosion-protective ALODINE 1200S solution to the aircraft structure which you prepared for bonding. Let the solution stay on the surfaces for two to three minutes. The surfaces will turn yellowish.

NOTE: The pot life of the corrosion-protective ALODINE 1200S solution is 24 hours.

- 6 With a clean cloth soaked in water, clean the alodized area a minimum of three times. Be careful not to cause damage to the corrosion-protective ALODINE 1200S film.
- 7 Let surfaces dry in the air.

NOTE: Do not touch the surfaces after you clean them.

- 8 Do the bonding immediately.

- (g) Method 8: Static dischargers - usually installed to the ends of the aircraft and to the trailing edges of the control surfaces. Refer to Figure 216.

NOTE: Static dischargers. Refer to [AMM MPP 23-60-00/500](#), [AMM MPP 23-60-00/600](#) and [AMM MPP 23-60-01/400](#).

- (h) Method 9: Grounding modules. Refer to Figure 217.

- 1 With a SCOTCH BRITE TYPE A sponge, remove the old Alodine from the structure which you will bond.
- 2 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the faying surfaces between the structures and the grounding module. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.
- 3 Do a visual inspection on the faying surfaces to make sure that there is no corrosion.

- 4 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the washers and nuts, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these items with a clean dry cloth.

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCOHOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

- 5 With a soft-bristle brush, apply corrosion-protective ALODINE 1200S solution to the aircraft structure which you prepared for bonding. Let the solution stay on the surfaces for two to three minutes. The surfaces will turn yellowish.

NOTE: The pot life of the corrosion-protective ALODINE 1200S solution is 24 hours.

- 6 With a clean cloth soaked in water, clean the alodized area a minimum of three times. Be careful not to cause damage to the corrosion-protective ALODINE 1200S film.

- 7 Let the surfaces dry in the air.

NOTE: Do not touch the surfaces after you clean them.

- 8 Do the bonding immediately.

- (i) Method 10: Palmer bonding (brackets, bonding jumpers, and grommets) - applicable to metal surfaces separated by nonconductive material (Palmer). Refer to Figure 218.

- 1 With a SCOTCH BRITE TYPE A sponge, remove the old Alodine from the structure which you will bond.
- 2 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the faying surfaces between the structures and the metal parts. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.
- 3 Do a visual inspection on the faying surfaces to make sure that there is no corrosion.
- 4 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the bolts, washers, and nuts, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these items with a clean dry cloth.

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCOHOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

- 5 With a soft-bristle brush, apply corrosion-protective ALODINE 1200S solution to the aircraft structure which you prepared for bonding. Let the solution stay on the surfaces for two to three minutes. The surfaces will turn yellowish.

NOTE: The pot life for the corrosion-protective ALODINE 1200S solution is 24 hours.

- 6 With a clean cloth soaked in water, clean the alodized area a minimum of three times. Be careful not to cause damage to the corrosion-protective ALODINE 1200S film.

- 7 Let the surfaces dry in the air.

NOTE: Do not touch the surfaces after you clean them.

- 8 Do the bonding immediately.

(j) Method 11: Tubular braid (electrical wiring). Refer to Figure 219.

- 1 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the faying surfaces between the structures and the clamp and its support and between the clamps and the tubular braid. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.

- 2 Do a visual inspection on the faying surfaces to make sure that there is no corrosion.

- 3 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the bolts, washers, and nuts, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these items with a clean dry cloth.

NOTE: Do not touch the surfaces after you clean them.

- 4 Do the bonding immediately.

(k) Method 12: Antenna base in contact with the skin - when you bond the antenna, you must let its base touch the fuselage skin. You must prepare the skin surface and the antenna base surface. Refer to the antenna removal/installation procedures in the AMM.

NOTE: The conductive-gel gaskets installed between the aircraft skin and the antennas are an effective barrier against corrosion. Thus, the surfaces prepared for bonding have a longer life. The metal mesh in the gasket gives an electrical bonding, which dissipates static charges and lightning strikes. The gel sealant is a very good interface sealing.

- 1 With a SCOTCH BRITE TYPE A sponge, remove the old Alodine from the skin surface and antenna base surface.

- 2 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the aircraft areas which you prepared for bonding. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.

- 3 Do a visual inspection on the faying surfaces to make sure that there is no corrosion.

- 4 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the bolts and the washers, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.

NOTE: Do not touch the surfaces after you clean them.

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCOHOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

- 5 With a soft-bristle brush, apply corrosion-protective ALODINE 1200S solution to the aircraft structure which you prepared for bonding. Let the solution stay on the surfaces for two to three minutes. The surfaces will turn yellowish.

NOTE: The pot life of the corrosion-protective ALODINE 1200S solution is 24 hours.

- 6 With a clean cloth soaked in water, clean the alodized area a minimum of three times. Be careful not to cause damage to the corrosion-protective ALODINE 1200S film.

- 7 Let the surfaces dry in the air.

- 8 Do the bonding immediately.

- (I) Method 13: Bonding of the connector to the structural surface - when you bond the connector, you must let its base touch the aircraft structure. For stainless-steel connectors bonded to aluminum structure, apply interface sealant CORBAN 27L. Refer to Figure 220.

- 1 With a SCOTCH BRITE TYPE A sponge, remove the old Alodine from the skin surface and antenna base surface.
- 2 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the aircraft areas which you prepared for bonding. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.
- 3 Do a visual inspection on the faying surfaces to make sure that there is no corrosion.
- 4 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the bolts and the washers, as applicable. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCOHOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

- 5 With a soft-bristle brush, apply corrosion-protective ALODINE 1200S solution to the aircraft structure which you prepared for bonding. Let the solution stay on the surfaces for two to three minutes. The surfaces will turn yellowish.

NOTE: The pot life of the corrosion-protective ALODINE 1200S solution is 24 hours.

- 6 With a clean cloth soaked in water, clean the alodized area a minimum of three times. Be careful not to cause damage to the corrosion-protective ALODINE 1200S film.

- 7 Let the surfaces dry in the air.

NOTE: Do not touch the surfaces after you clean them.

- 8 Do the bonding immediately.

(m) Method 15: Electrical bonding of metal-to-metal structure. Refer to Figure 221.

- 1 With a SCOTCH BRITE TYPE A sponge, remove the old Alodine from the skin surface and antenna base surface.

- 2 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the aircraft areas which you prepared for bonding. Before the RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.

- 3 Do a visual inspection on the faying surfaces to make sure that there is no corrosion.

- 4 With a clean cloth soaked in RHODIASOLVE E-23 solvent, clean the bolts and the washers, as applicable. Before RHODIASOLVE E-23 solvent evaporates, dry these areas with a clean dry cloth.

NOTE: Do not touch the surfaces after you clean them.

WARNING: DO NOT MIX ALODINE WITH ORGANIC SOLVENTS (ALCOHOLS, KETONES, ETC.). WHEN YOU MIX ALODINE AND ORGANIC SOLVENTS, AN EXPLOSION CAN OCCUR AND CAUSE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

- 5 With a soft-bristle brush, apply corrosion-protective ALODINE 1200S solution to the aircraft structure which you prepared for bonding. Let the solution stay on the surfaces for two to three minutes. The surfaces will turn yellowish.

NOTE: The pot life of the corrosion-protective ALODINE 1200S solution is 24 hours.

- 6 With a clean cloth soaked in water, clean the alodized area a minimum of three times. Be careful not to cause damage to the corrosion-protective ALODINE 1200S film.

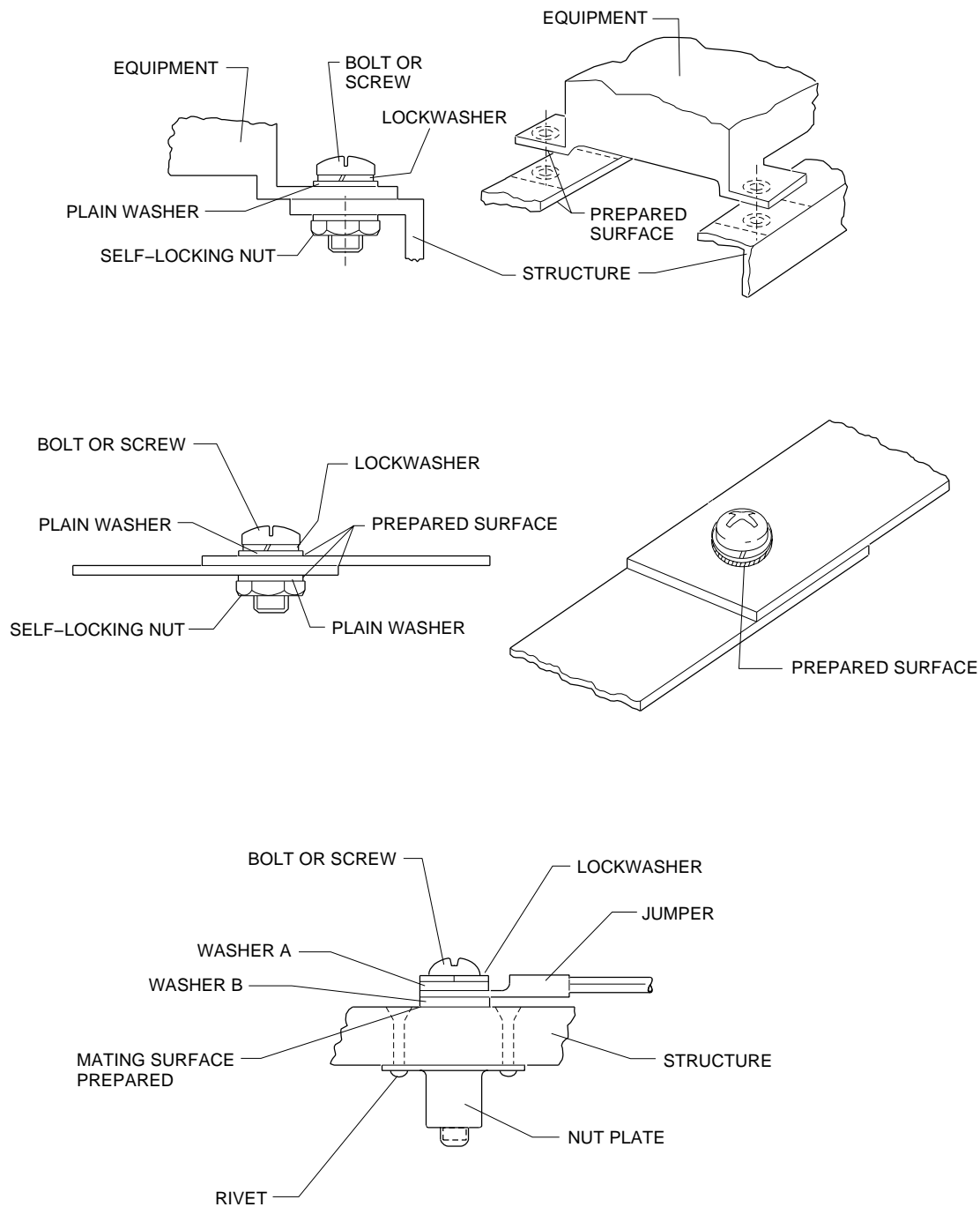
- 7 Let the surfaces dry in the air.

8 Do the bonding immediately.

EFFECTIVITY: ALL

Bonding Through Screw or Bolt with Self-Locking Nuts or Nutplates

Figure 204

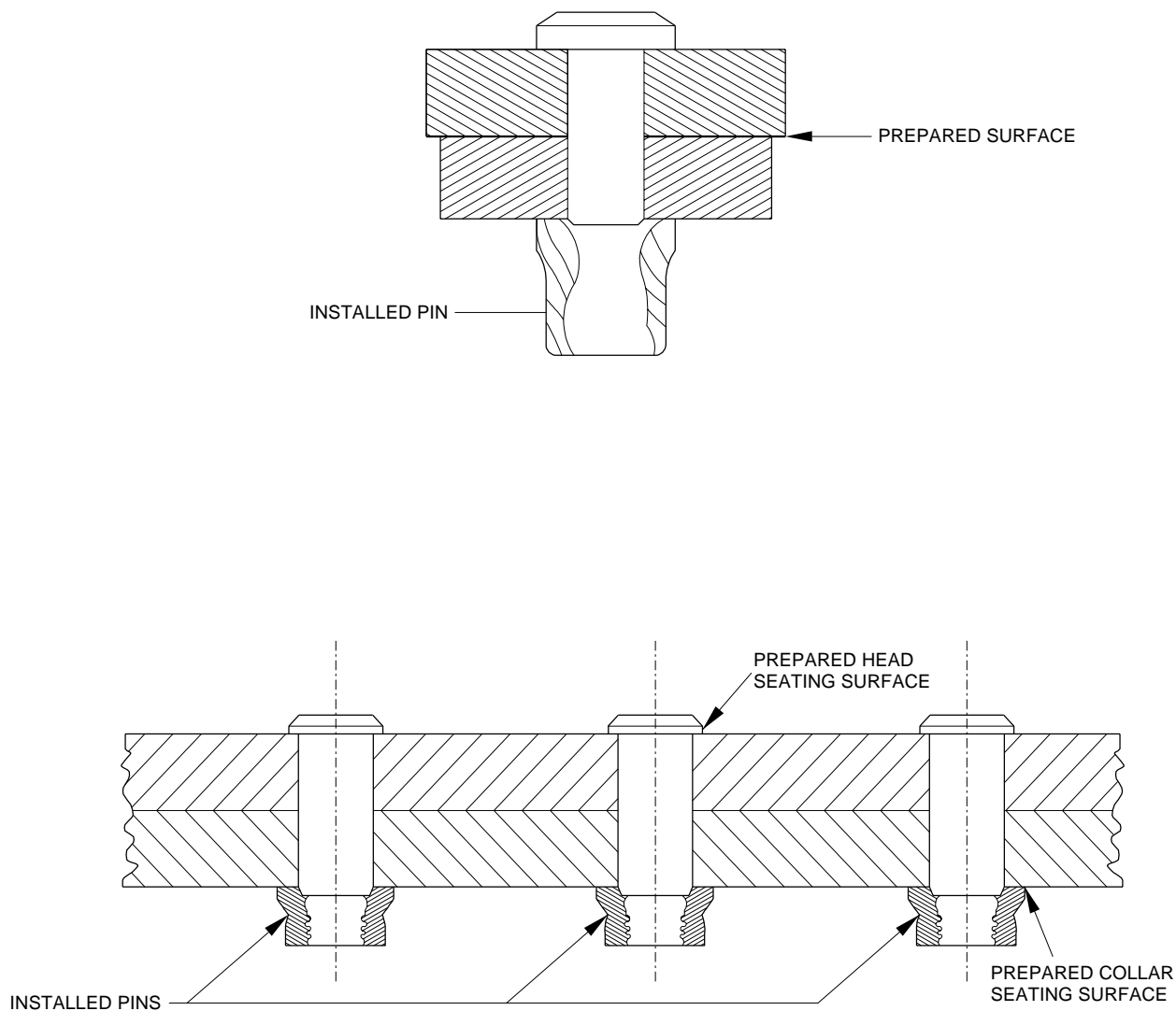


EM145AMM200103A.DGN

EFFECTIVITY: ALL

Bonding with Hi-Lock or Hi-Lite Pin

Figure 205

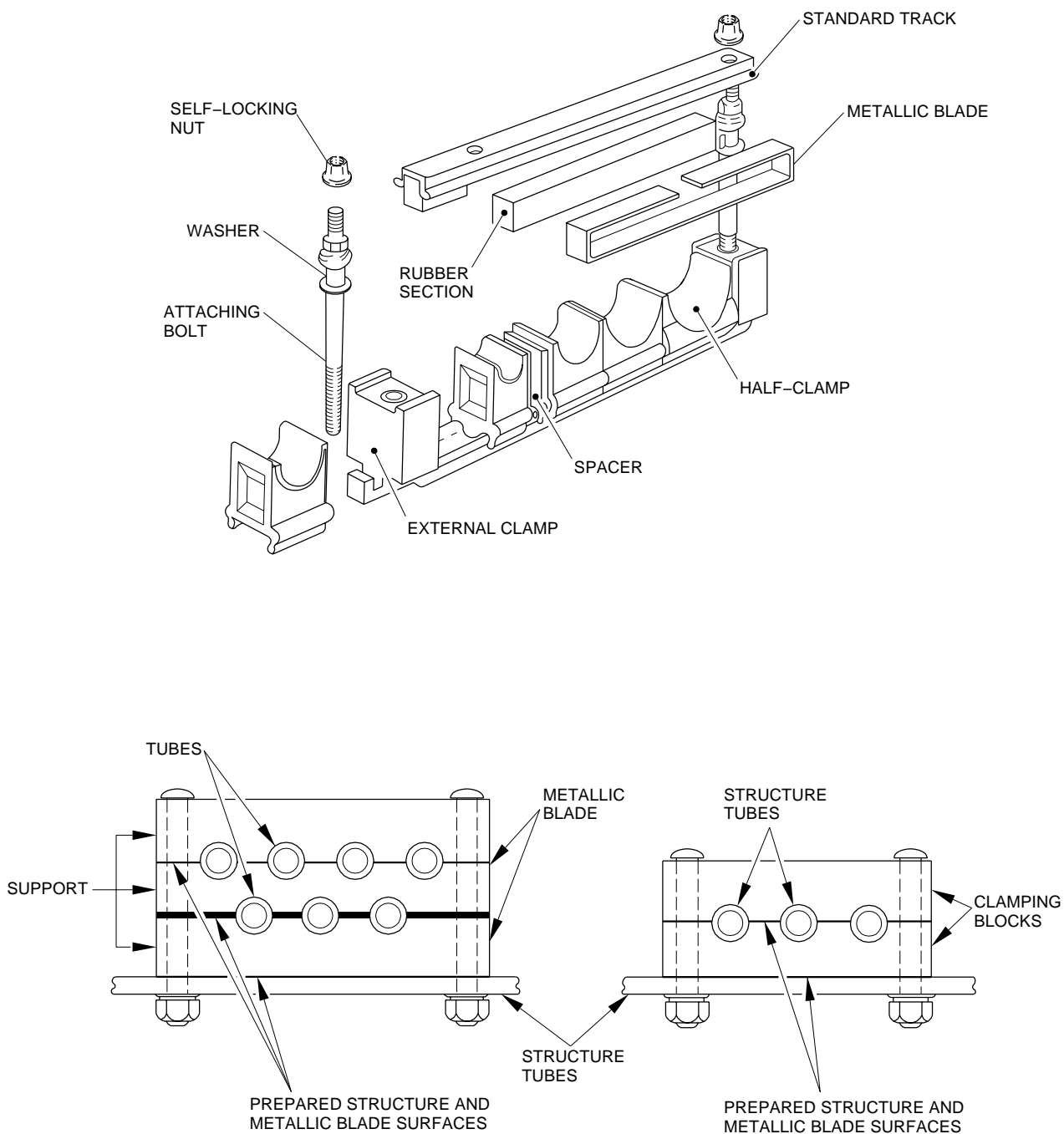


145AMM200176.MCE

EFFECTIVITY: ALL

Bonding with Tube Assembly of Clamping Block Modules or Clamping Block

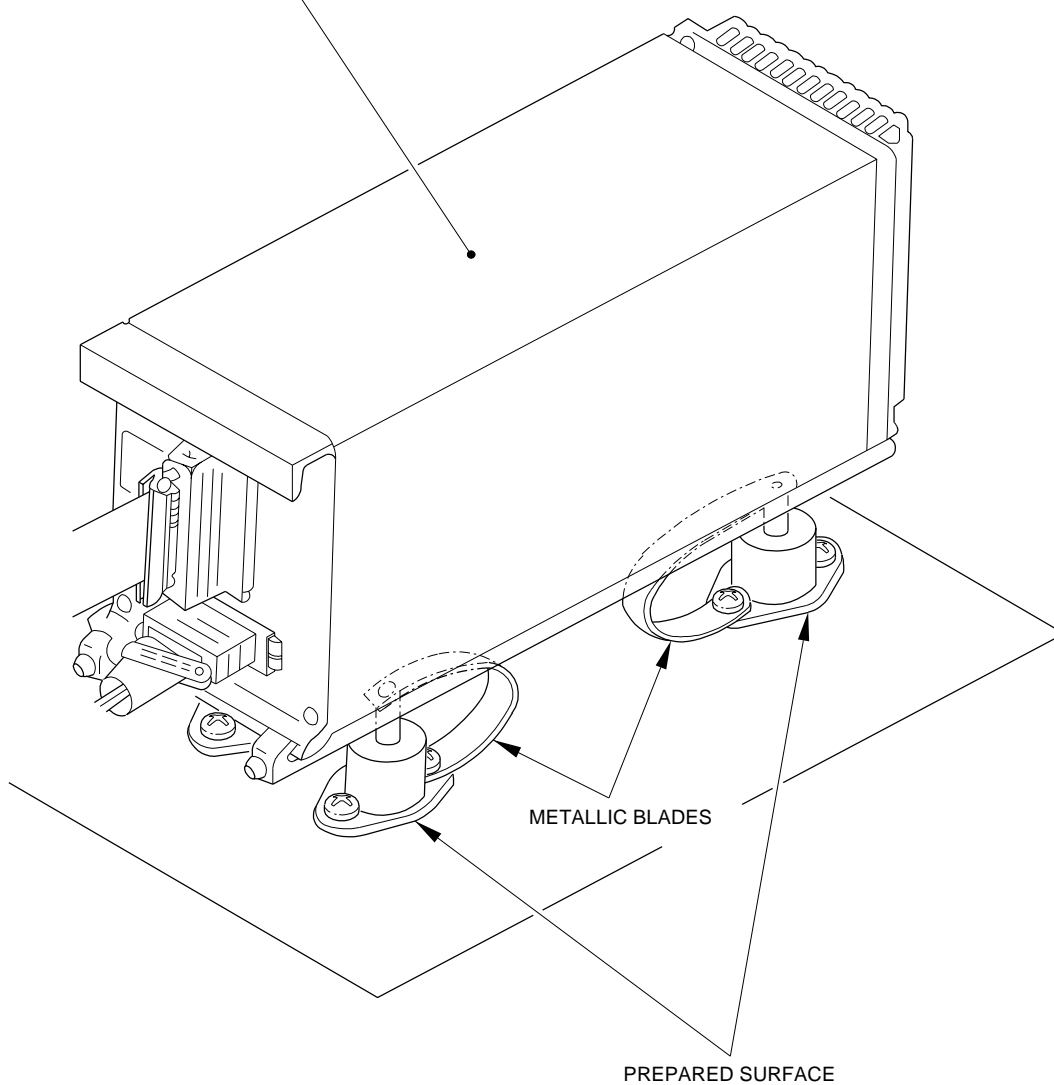
Figure 206



145AMM200177.MCE

EFFECTIVITY: ALL
Bonding with Metal Blades
Figure 207

SHOCKMOUNT-INSTALLED EQUIPMENT

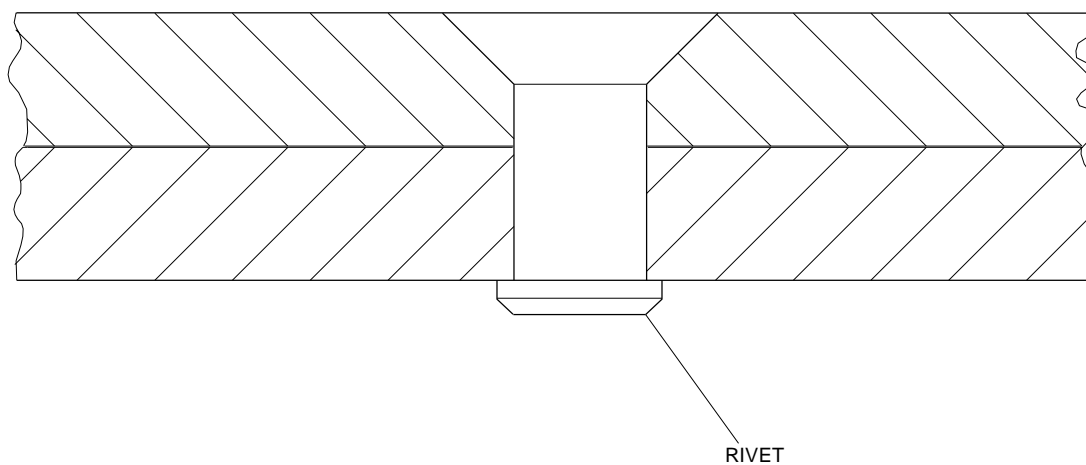


145AMM200178.MCE

EFFECTIVITY: ALL

Bonding Structure-to-Structure with Rivets

Figure 208

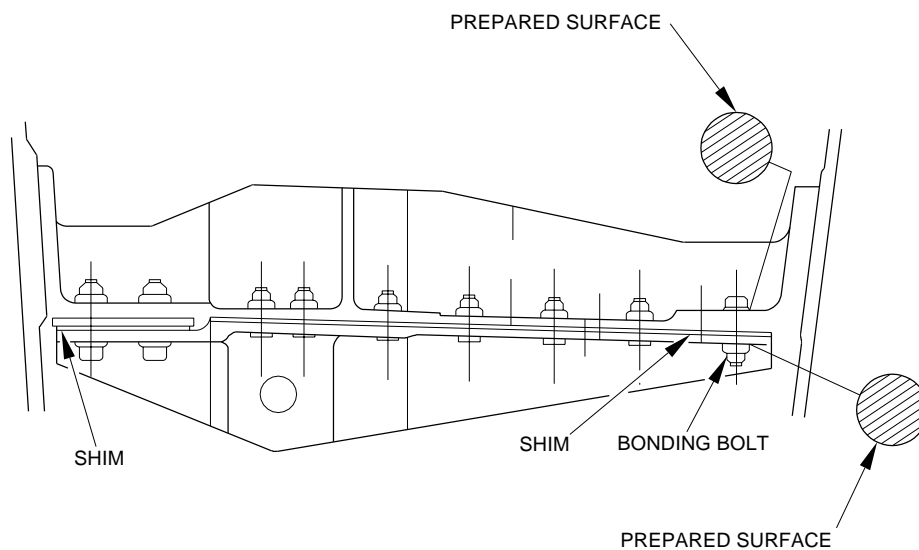
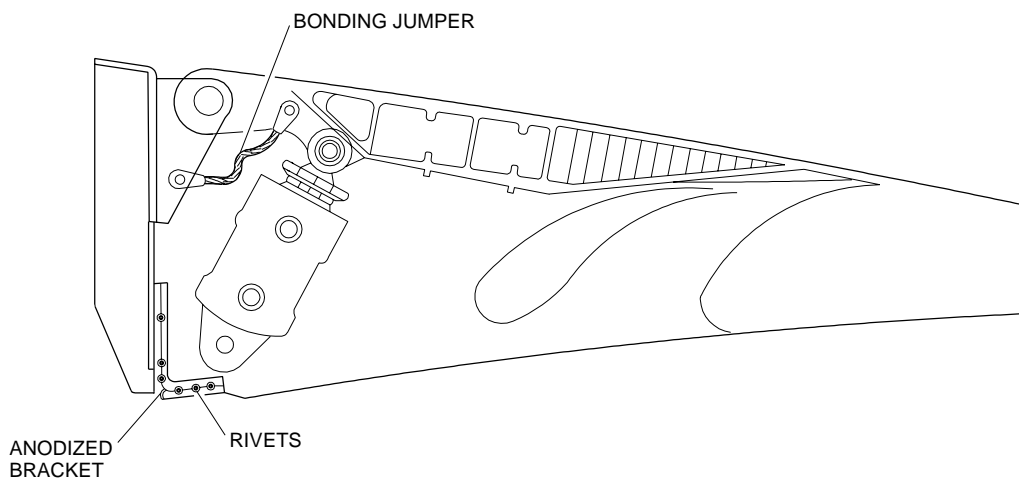


145AMM200179.MCE

EFFECTIVITY: ALL

Bonding of Anodized Brackets and Anodized Structure with Rivets or Bolts

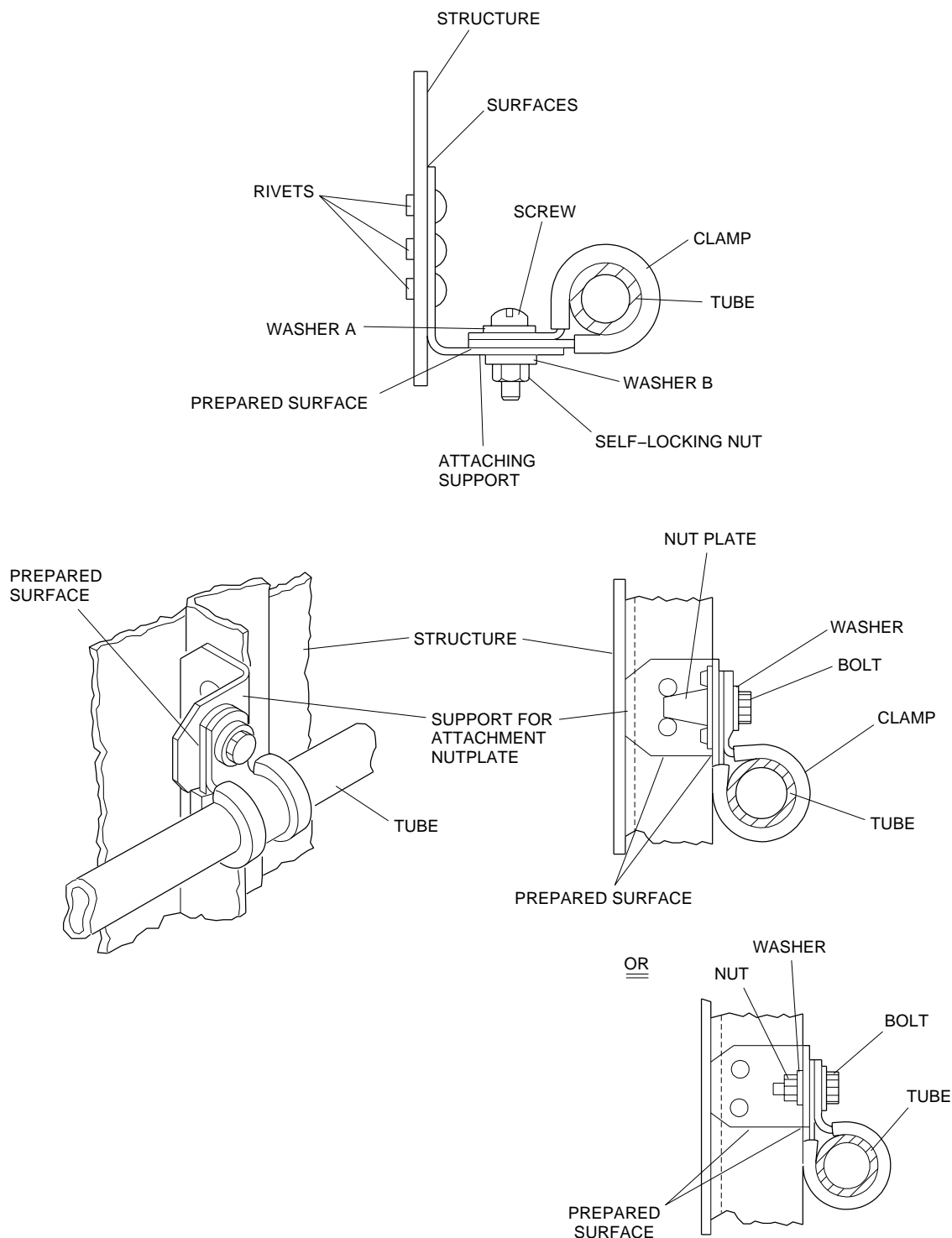
Figure 209



145AMM200180.MCE

EFFECTIVITY: ALL

Bonding with Support Connected to Structure and Bonding Directly to the Structure through Clamp
Figure 210

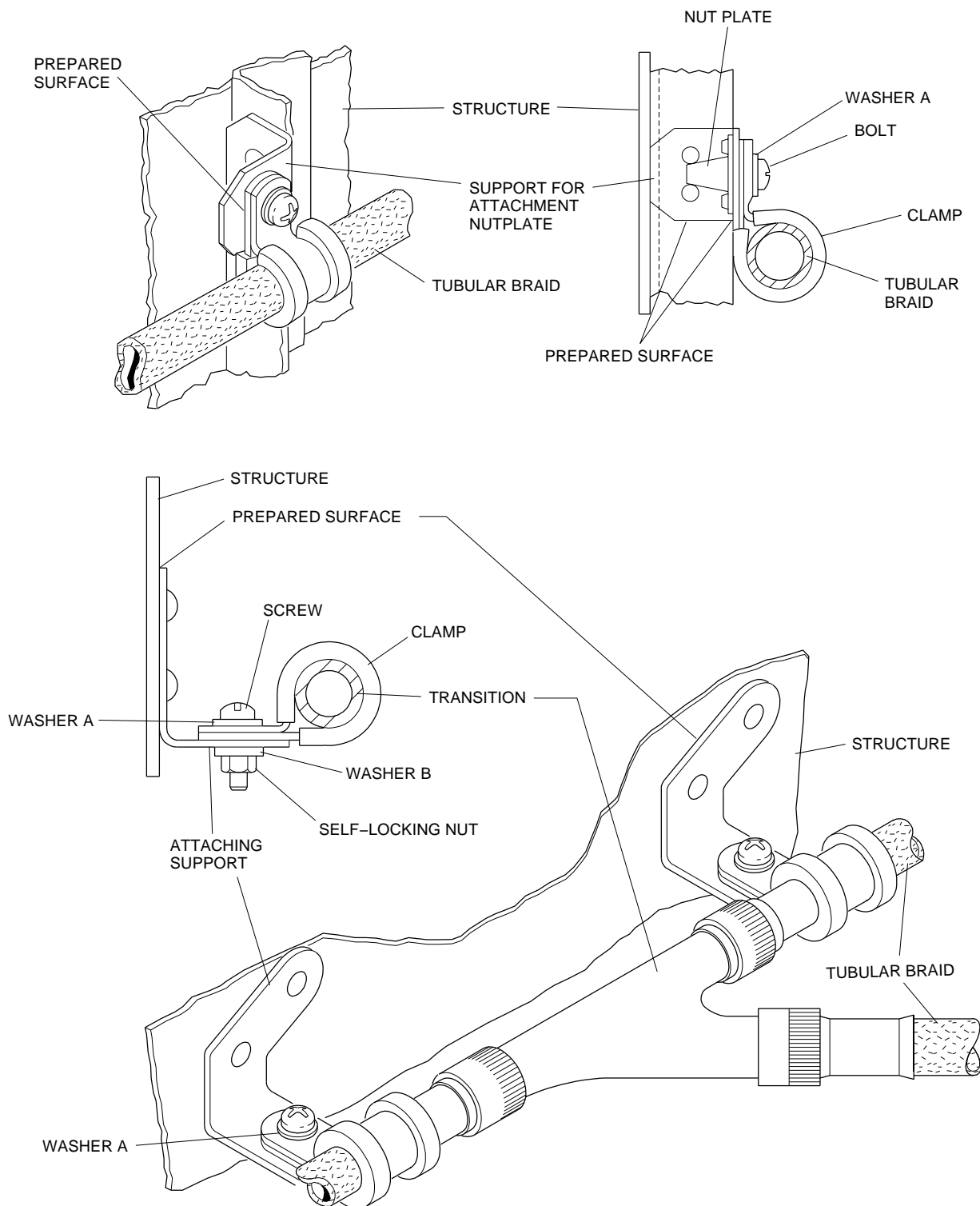


EM145AMM200100A.DGN

EFFECTIVITY: ALL

Bonding through Clamp with One or Two Jumper Interconnecting Tubes

Figure 211

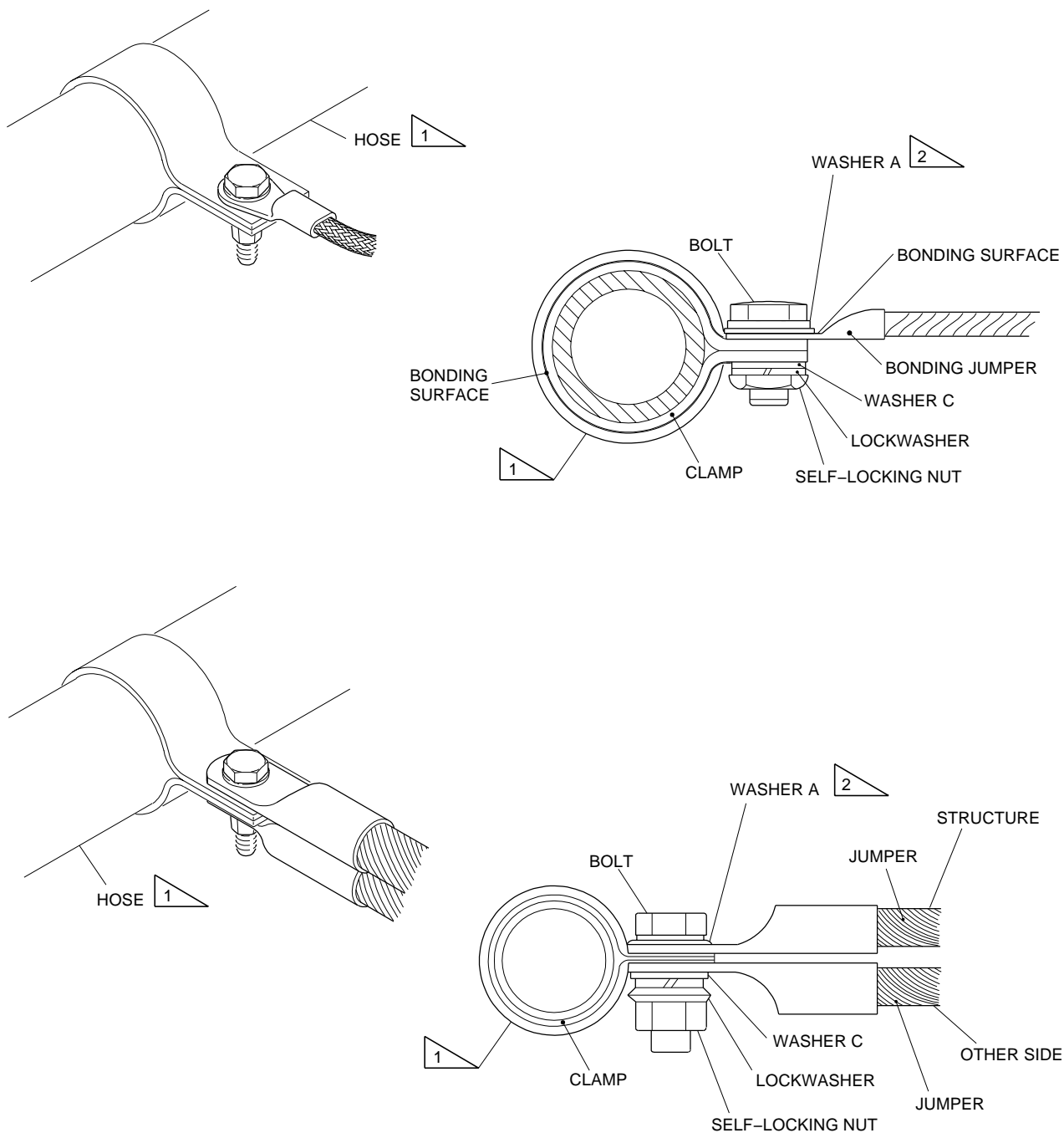


EM145AMM200104A.DGN

EFFECTIVITY: ALL

Bonding with Clamp with One or Two Jumper Interconnecting Hoses or Tubes

Figure 212



1 APPLY SEALANT ON TUBE.

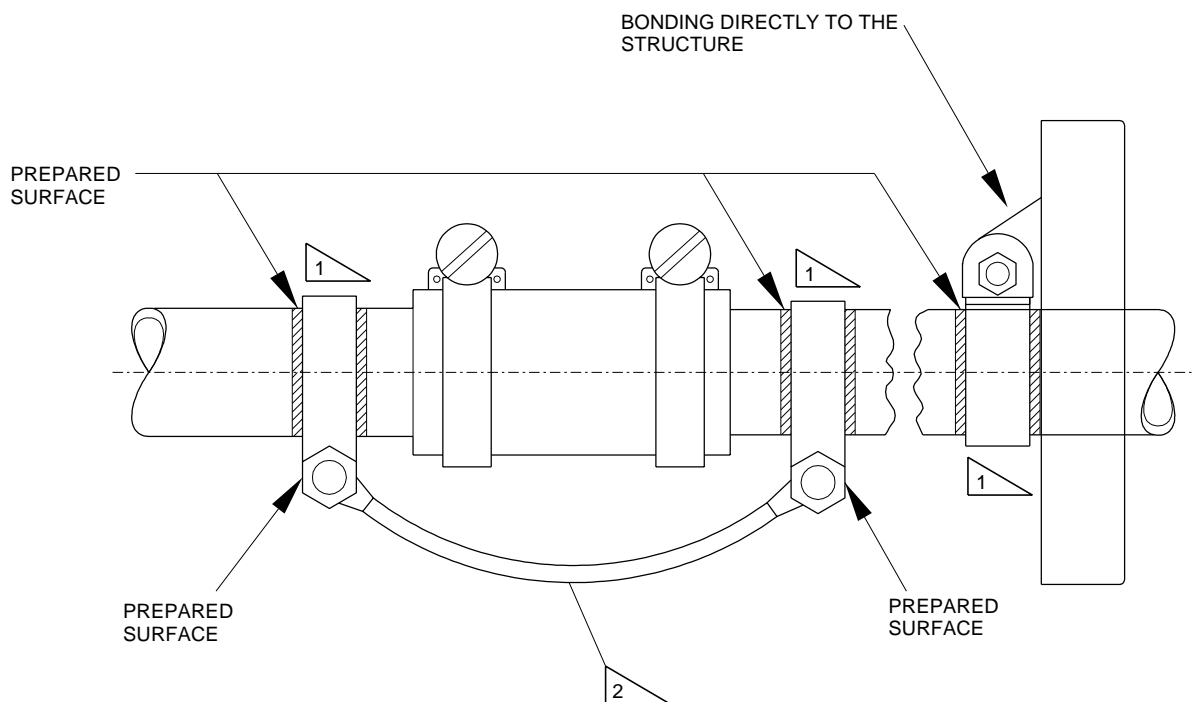
2 THIS WASHER "A" IS NOT NECESSARY WHEN TORQUE IS APPLIED TO THE NUT.

145AMM200181.MCE

EFFECTIVITY: ALL

Bonding of Metal Tube Segments

Figure 213



1 CENTER CLAMP ON THE PREPARED SURFACE OF THE TUBE

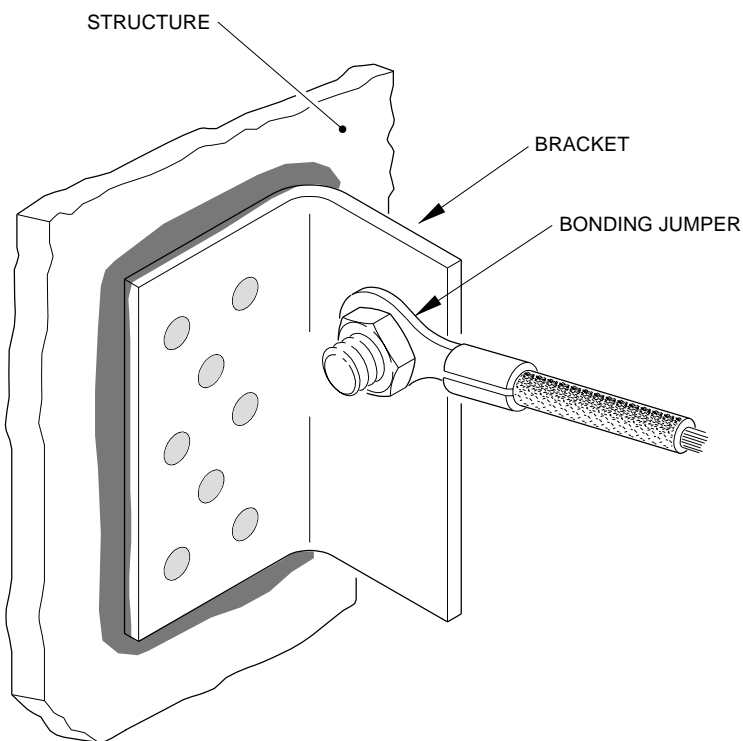
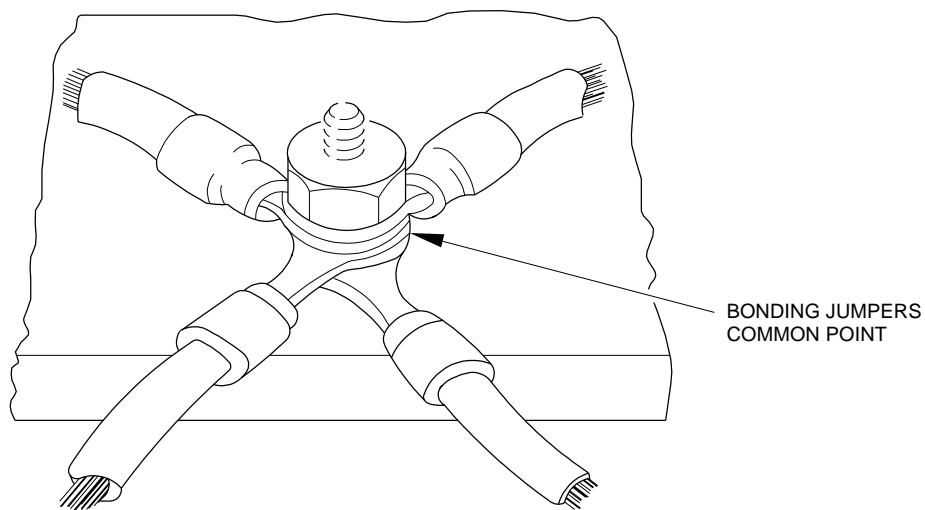
2 PLACE THE BONDING JUMPER ON THE BOTTOM SIDE

145AMM200182.MCE

EFFECTIVITY: ALL

Bonding Jumper Connected to a Bracket and Common Point for Connection of Bonding Jumpers

Figure 214

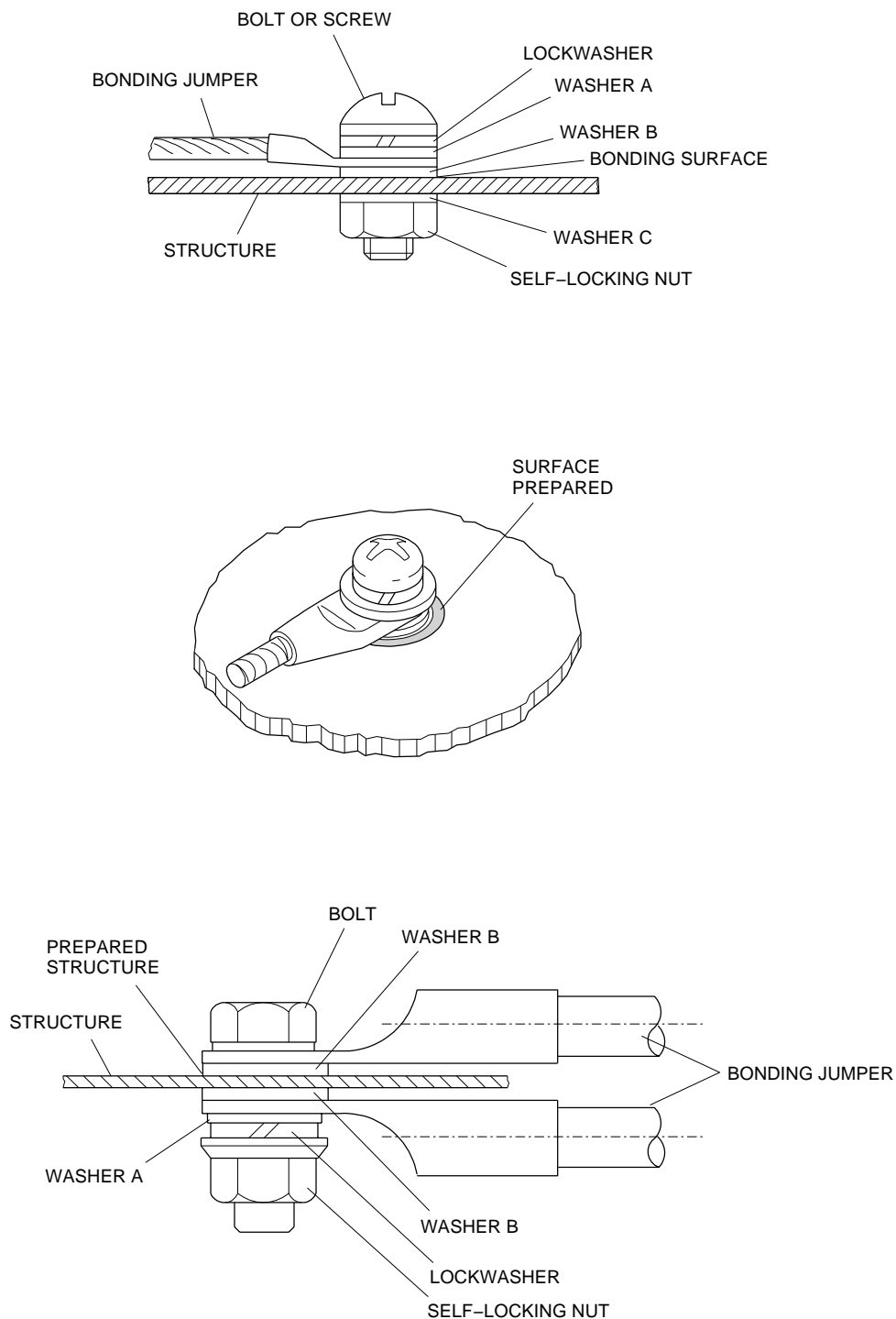


145AMM200183.MCE

EFFECTIVITY: ALL

Bonding with One or Two Braided Wire Bonding Jumpers

Figure 215

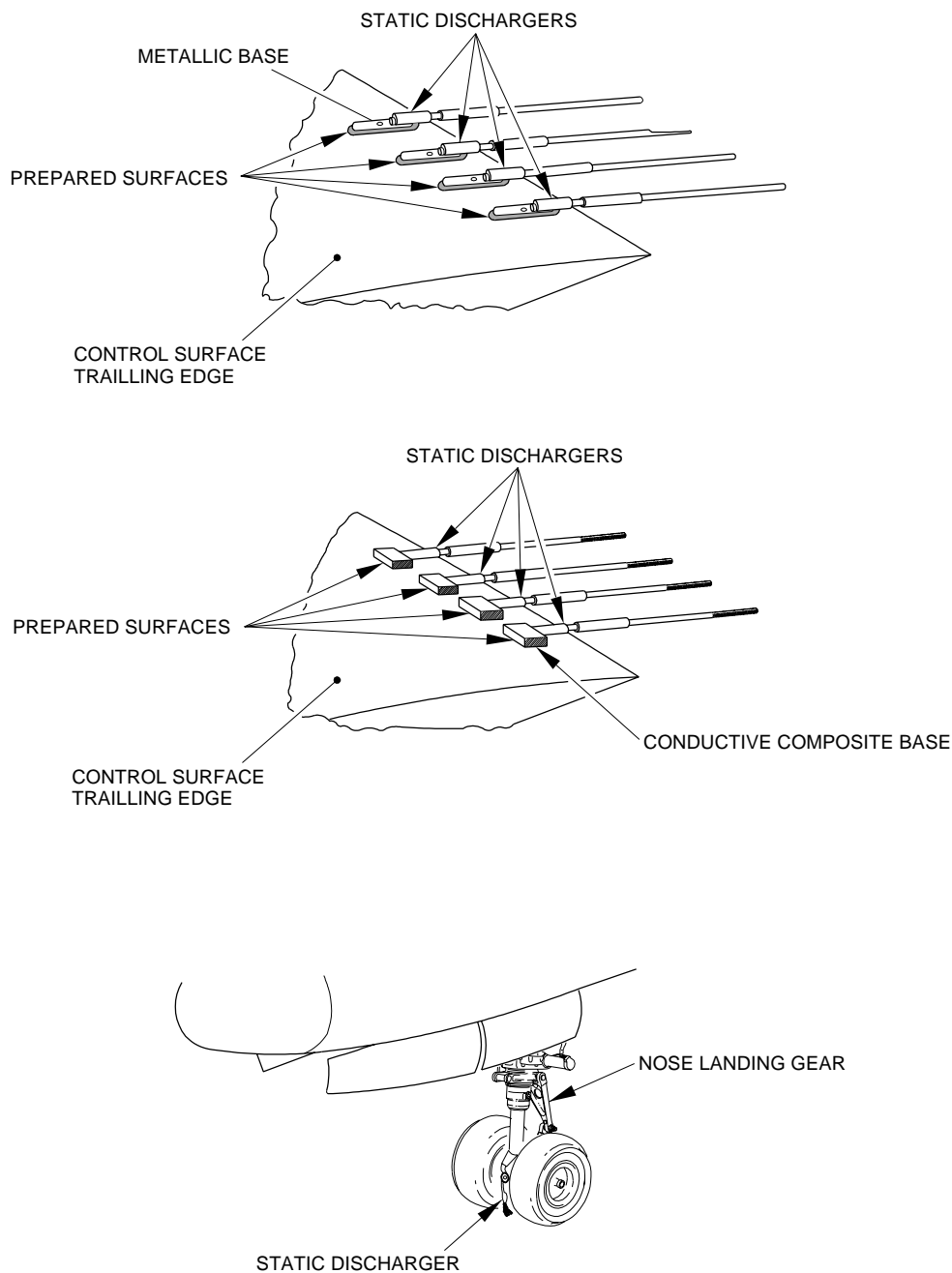


EM145AMM200107A.DGN

EFFECTIVITY: ALL

Static Dischargers - Location

Figure 216

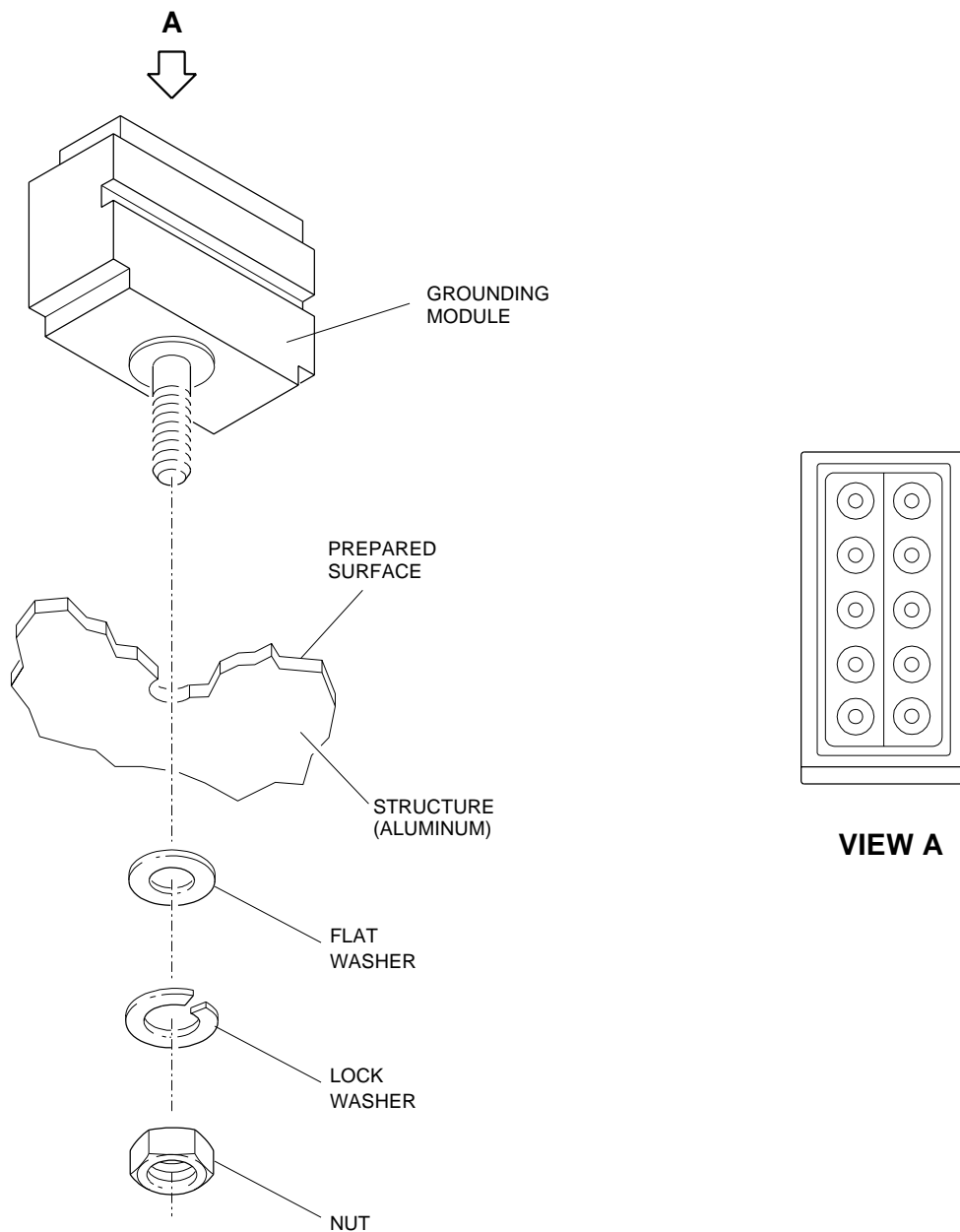


145AMM200184.MCE

EFFECTIVITY: ALL

Bonding with Grounding Modules

Figure 217

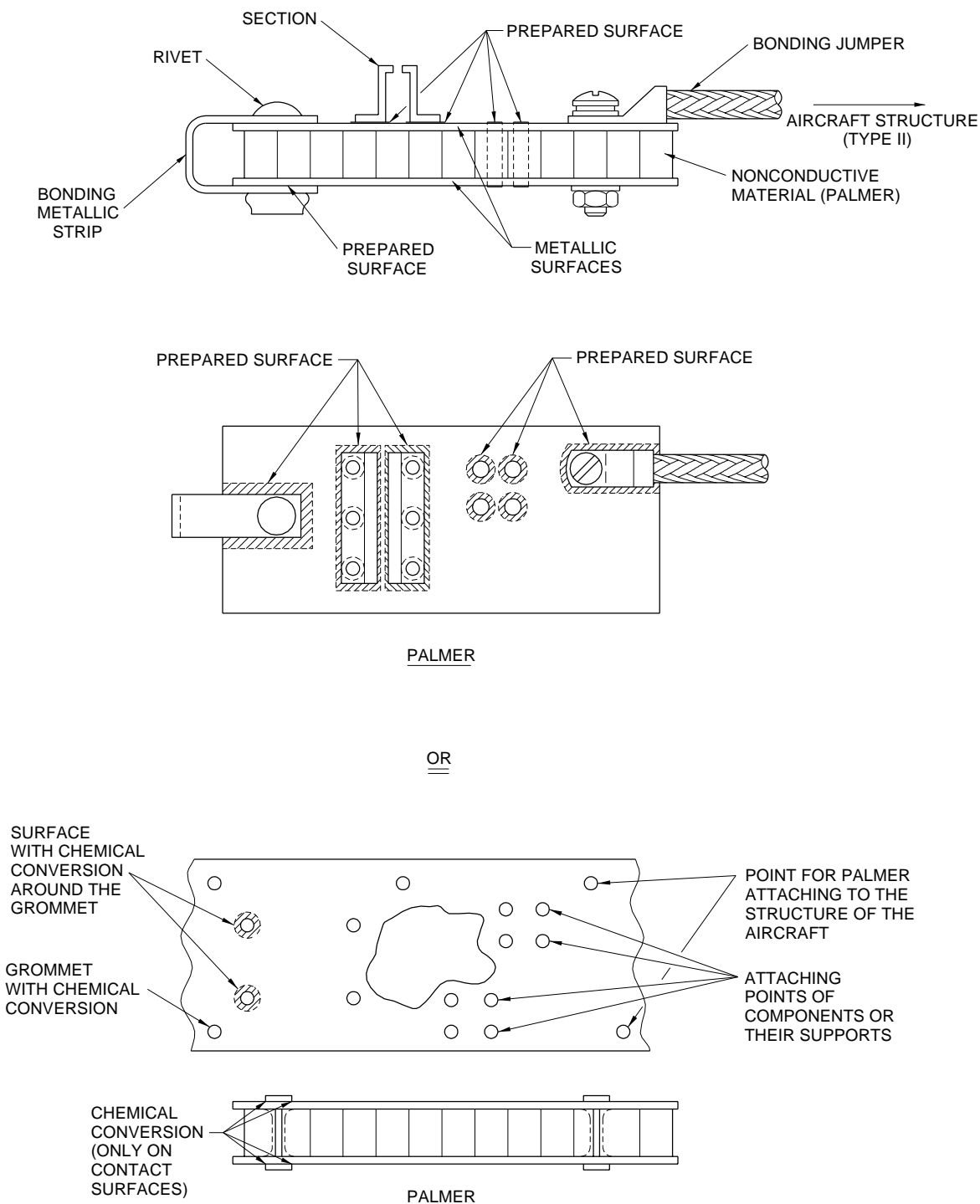


EM145AMM200185A.DGN

EFFECTIVITY: ALL

Bonding of Metal Surfaces Separated by Nonconductive Material

Figure 218

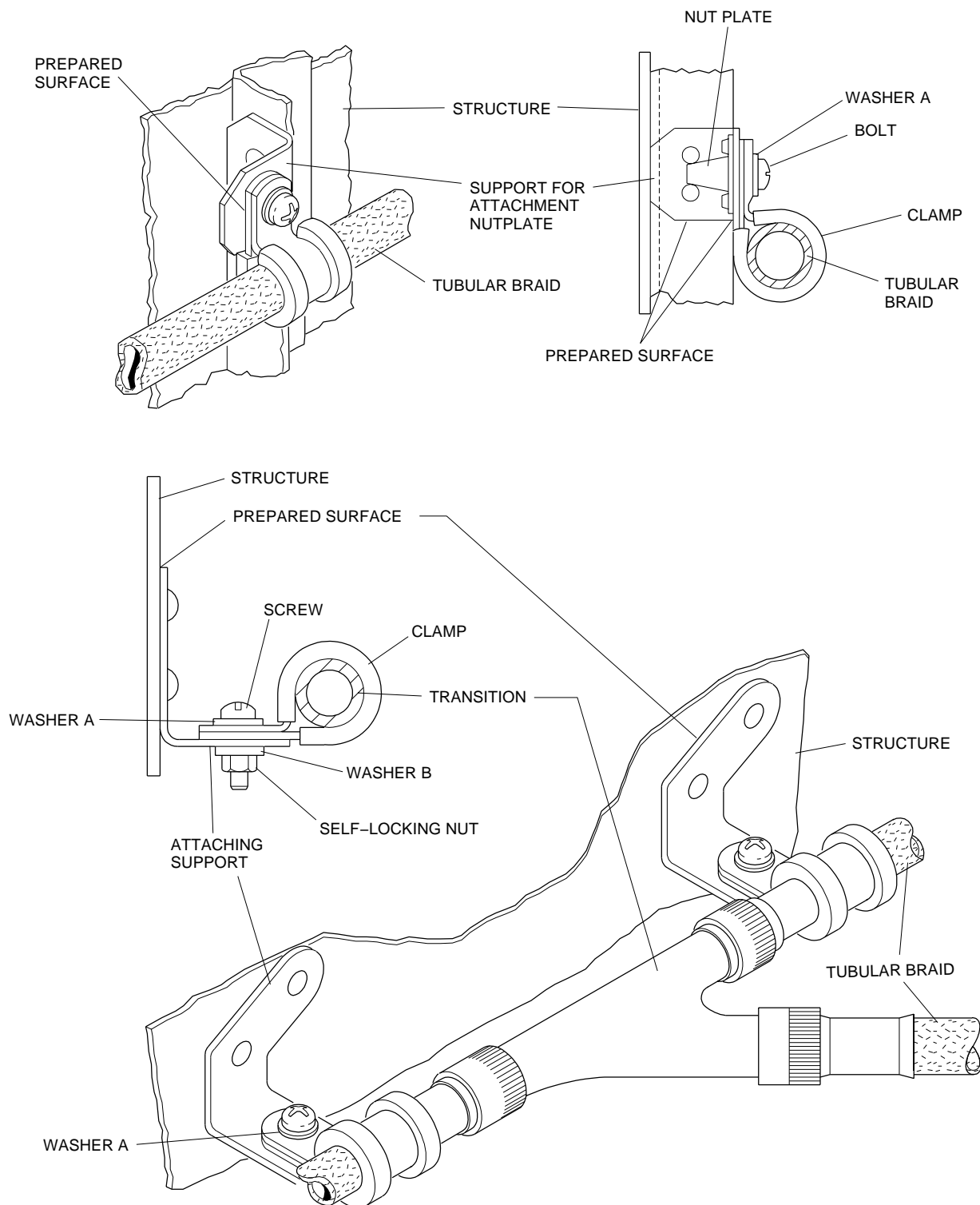


EM145AMM200108A.DGN

EFFECTIVITY: ALL

Bonding of Electrical Wiring Tubular Braid

Figure 219

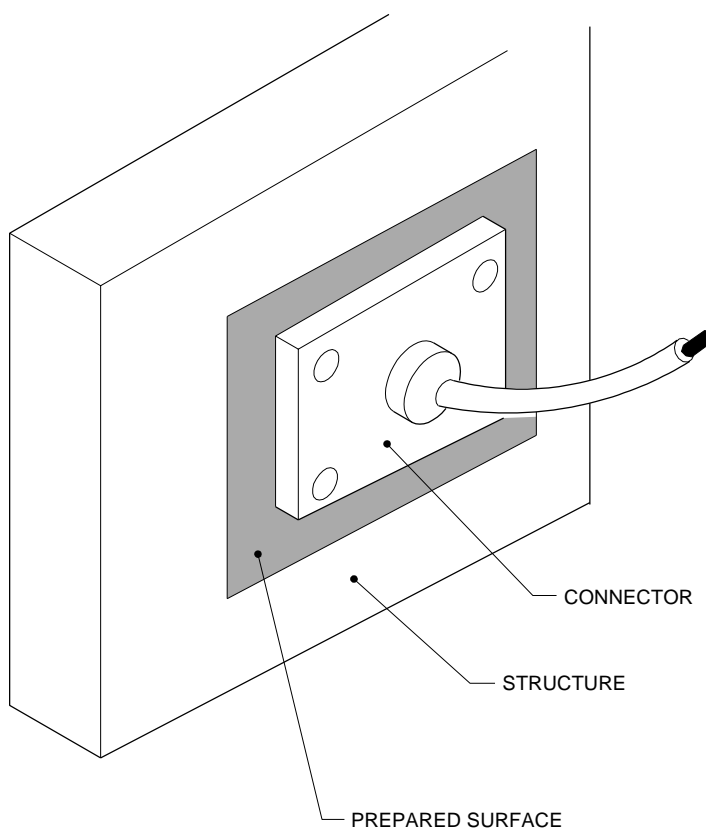


EM145AMM200104A.DGN

EFFECTIVITY: ALL

Bonding of Connector to Structural Surface

Figure 220

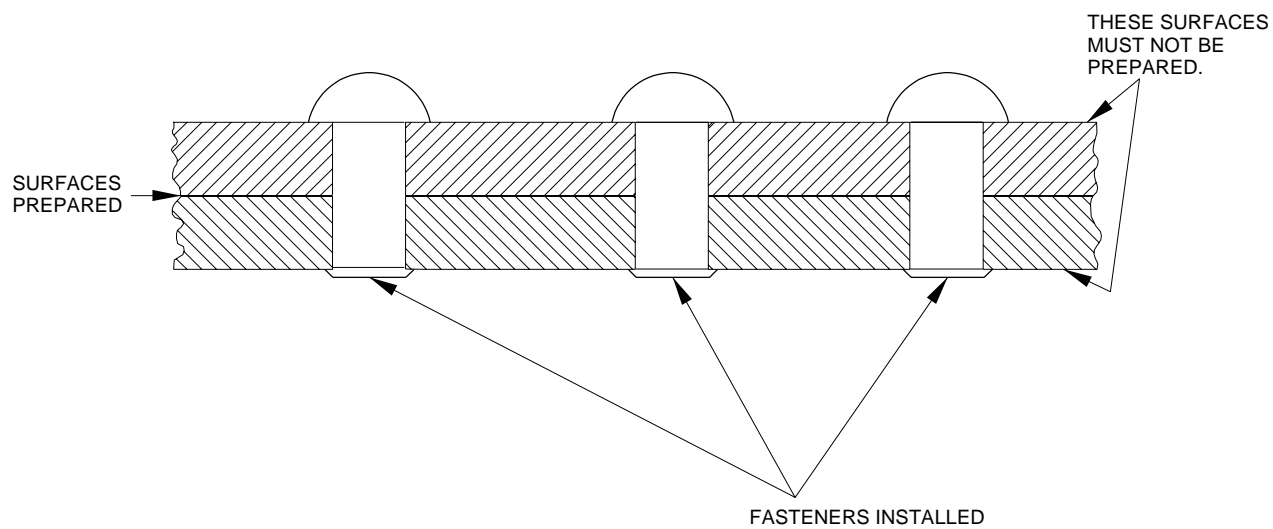


145AMM200186.MCE

EFFECTIVITY: ALL

Bonding of Metal-to-Metal Structures

Figure 221



145AMM200187.MCE

TASK 20-13-21-910-802-A

EFFECTIVITY: ALL

5. ELECTRICAL BONDING PROTECTION - STANDARD PROCEDURES

A. General

- (1) This task gives the procedures to do the protection of the surface around the bonding assembly.
- (2) An electrical/avionics-systems maintenance technician is necessary to do this task.

B. Zones and Accesses

Not Applicable

C. Tools and Equipment

Not Applicable

D. Auxiliary Items

Not Applicable

E. Consumable Materials

<i>SPECIFICATION (BRAND)</i>	<i>DESCRIPTION</i>	<i>QTY</i>
MEP 10-057	Fluid-Resistant Nylon NYCOTE 7-11-DARK BLUE Varnish	AR
AMS-S-8802	Type-II Class-B2 Polysulfide Rubber Sealant, PR1440B2	AR
AMS 3374	Type-I Fireproof Gray Polysulfide Sealant, PS700	AR

F. Expandable Parts

Not Applicable

G. Persons Recommended

<i>QTY</i>	<i>FUNCTION</i>	<i>PLACE</i>
1	Does the task	AR

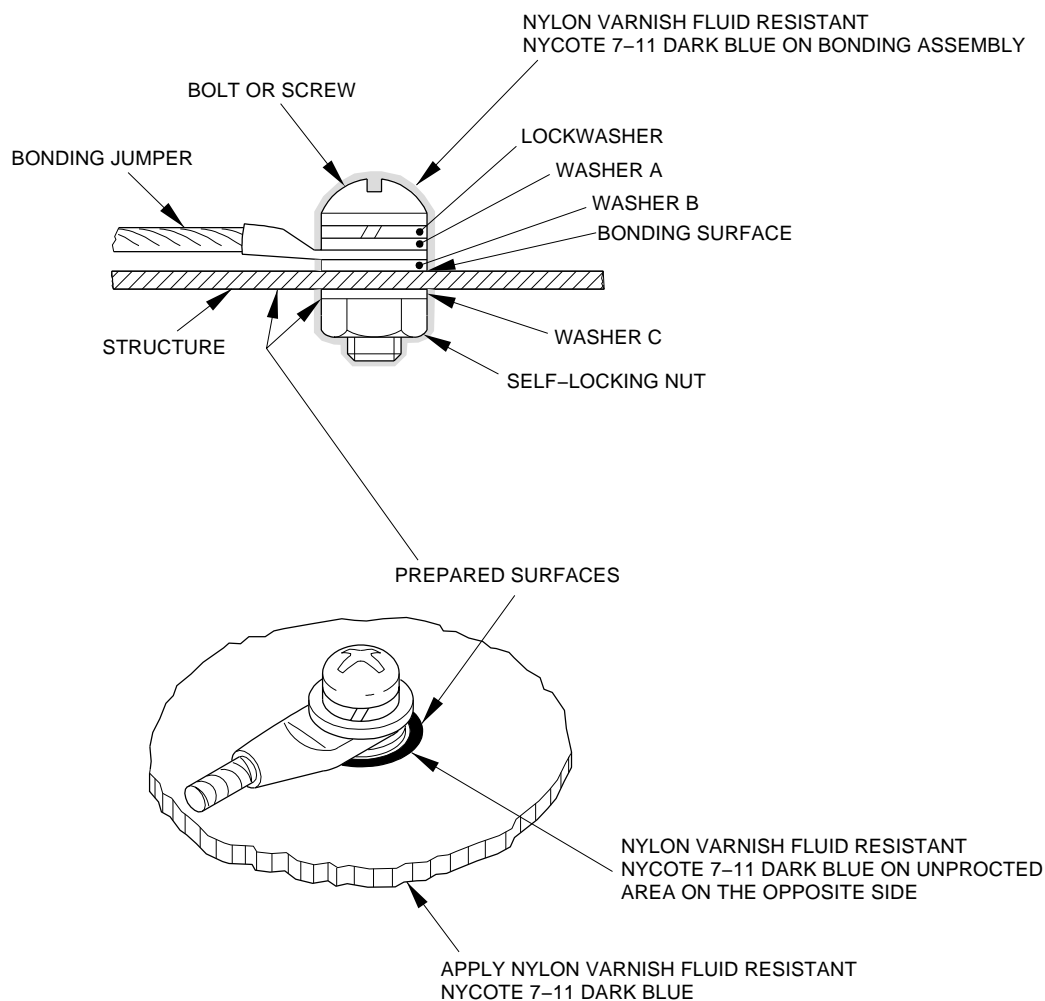
H. Protection of the Electrical Bonding Surfaces

SUBTASK 910-004-A

- (1) Do the protection of the surface around the bonding assembly as follows:
 - (a) Parts without finish (titanium, stainless steel, bronze) and anodized aluminum parts - Apply NYCOTE 7-11-DARK BLUE varnish to all the bonding assembly. Refer to Figure 222, Figure 223, Figure 224, and Figure 225.
 - (b) Parts exposed to SKYDROL LD-4 hydraulic fluid and/or to aggressive environmental conditions (high level of humidity and contaminations) - Apply sealant PR1440B2 along the contour of the bonding assembly and on all rivets. After the sealant curing time, apply NYCOTE 7-11-DARK BLUE varnish on the sealant surface and other areas. Refer to Figure 226.

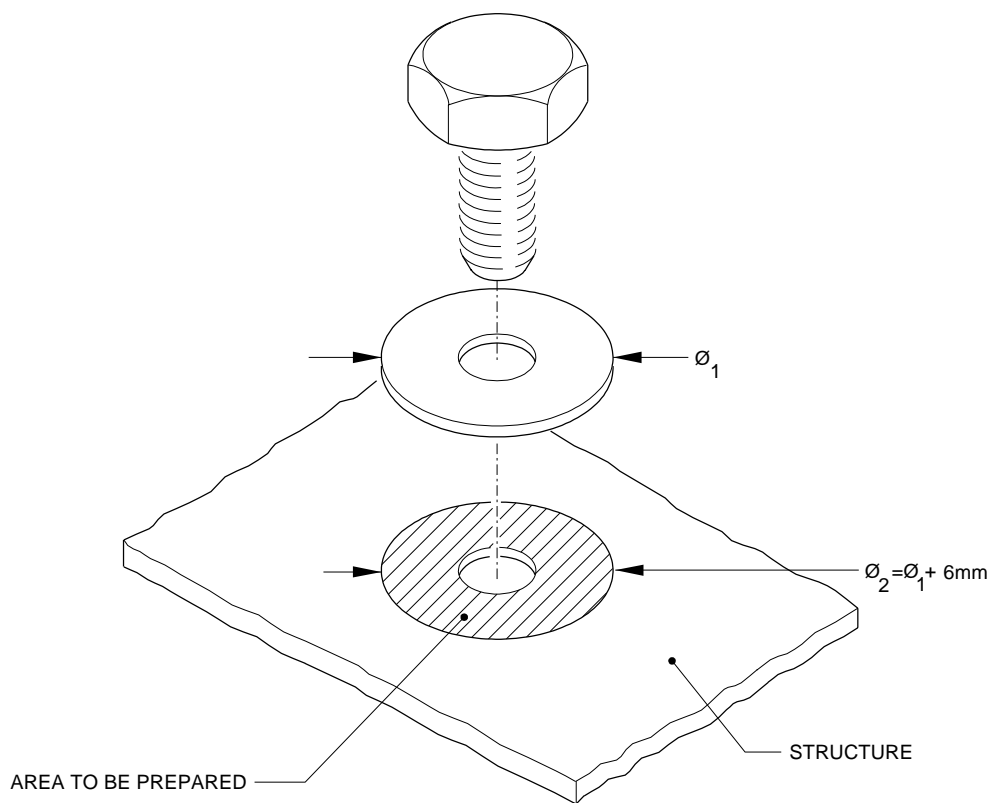
- (c) In areas that have temperatures of more than 130°C, apply only sealant PS700. In this condition, you must not apply NYCOTE 7-11-DARK BLUE varnish.
- (d) Parts in direct contact with fuel (inside the fuel tanks). Refer to Figure 227.
 - 1 Critical lightning zone (areas subject to direct lightning strike):
 - a Apply sealant PR1440B2 around the Bonding Assembly for protection of the surface.
 - 2 Noncritical Lightning Zone (areas not subject to direct lightning strike):
 - a Apply NYCOTE 7-11-DARK BLUE varnish around the bonding assembly for protection of the surface.

EFFECTIVITY: ALL
Typical Bonding Protection
Figure 222



145AMM200188.MCE

EFFECTIVITY: ALL
 Finished Parts - Circular Areas
 Figure 223

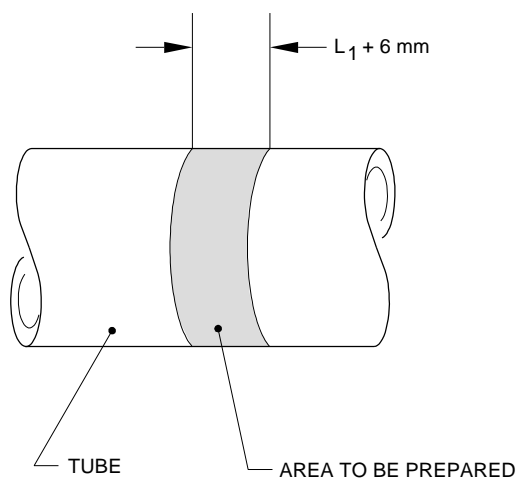
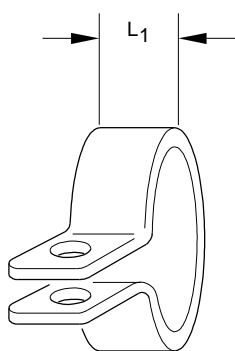


145AMM200189.MCE

EFFECTIVITY: ALL

Finished Parts - Cylindrical Areas

Figure 224

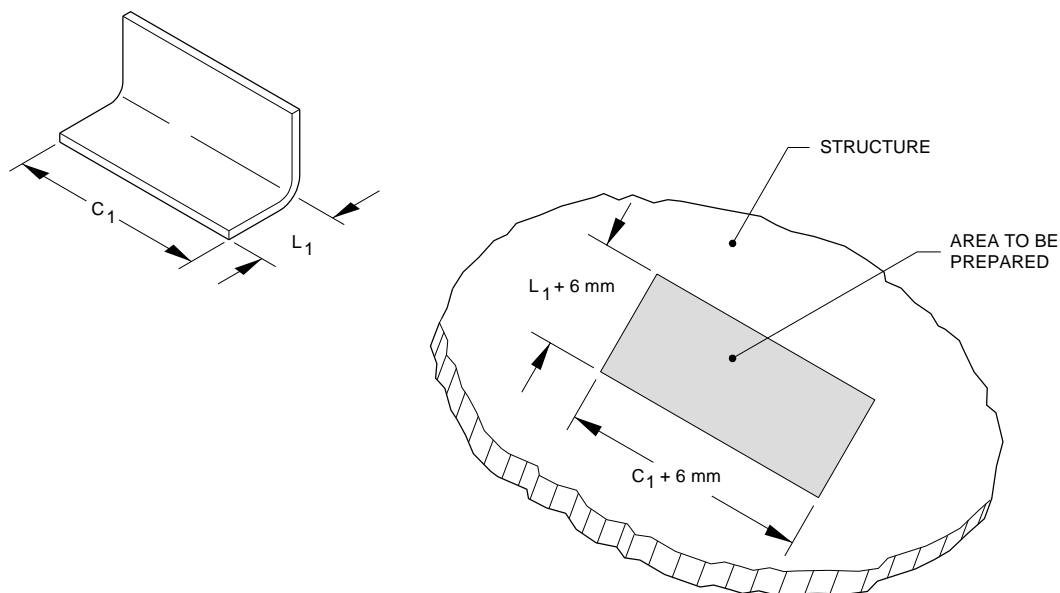


145AMM200190.MCE

EFFECTIVITY: ALL

Finished Parts - Square and Rectangular Areas

Figure 225

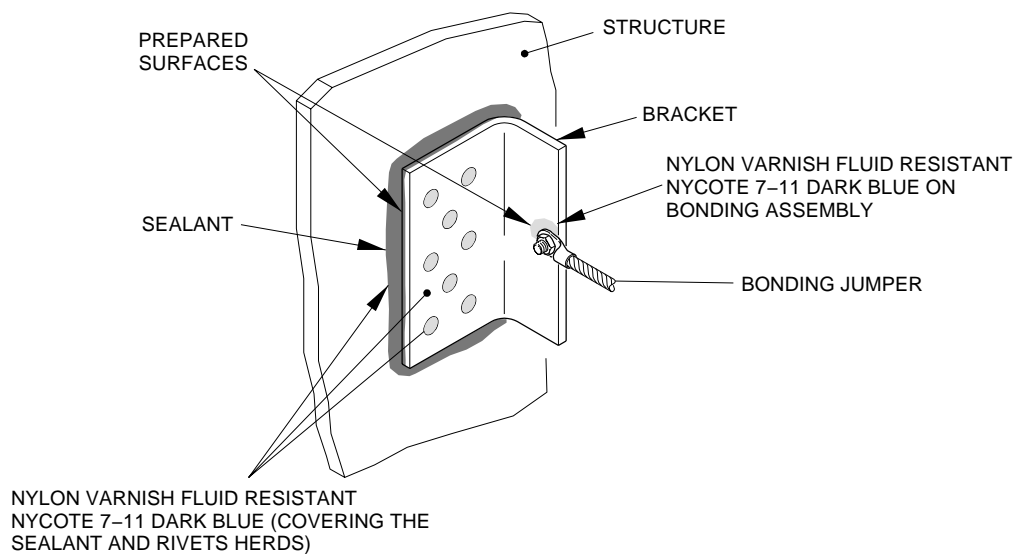
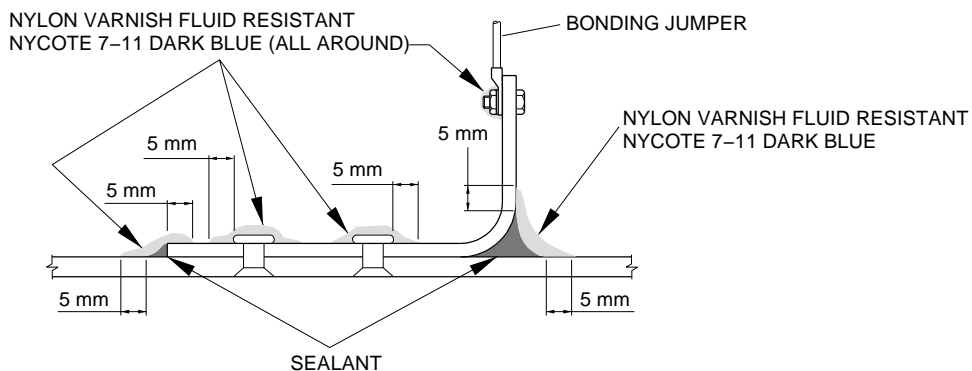


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EFFECTIVITY: ALL

Typical Frame - Protection and Sealing

Figure 226

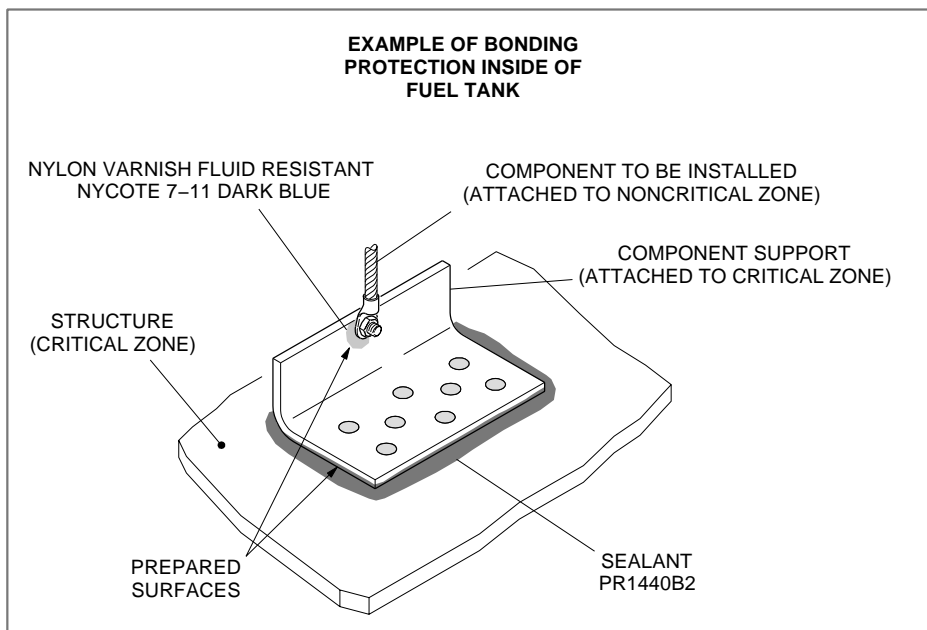
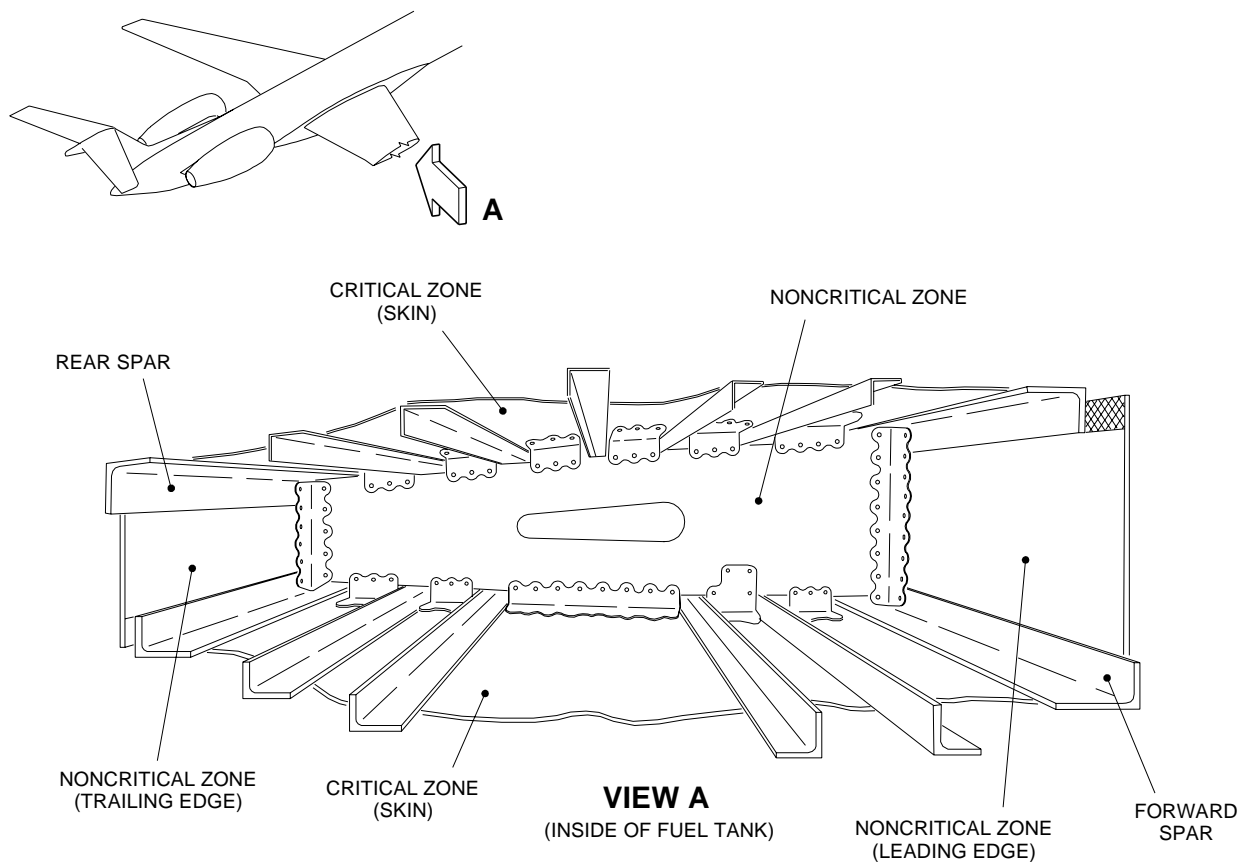


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EFFECTIVITY: ALL

Fuel-Tank Critical Zones/Bonding Protection

Figure 227



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