

Instruction
Hardware Engineering

No. LMS 1-2

Subject: Rework Procedures

APPROVED BY Manager, Hardware Engineering

STATUS Maintenance Revision

PURPOSE Define acceptable rework procedures for nonconforming materials that are rejected and dispositioned by Quality Assurance. Used by L-3 Communications Corporation, Link Simulation & Training Division (hereafter referred to as Link) Manufacturing and Support Operations/ Field Service personnel when reworking nonconforming material which has been rejected and dispositioned by Quality Assurance.

NOTE

Certain portions of this instruction are notes as “not applicable” to Support Operations/Field Service Personnel” due to the fact that personnel so not have the necessary tooling and processes in the field to perform that part of the instruction. If the noted portions of the instruction are required to be performed on field equipment, that equipment will need to be returned to the plant or depot for processing.

AFFECTED FUNCTIONS Hardware Engineering
Manufacturing

REFERENCES **LMS 7-1** Arc Welding
LMS 9-1 Painting

DEFINITIONS Nonconformance. The failure of a characteristic to conform to the requirements specified in the contract, drawings, specifications, or other approved product description.

Nonconforming material. Any item, part, supplies, or product containing one or more nonconformances.

Normally visible surfaces. Normally visible surfaces shall be interpreted to mean the visible exterior surfaces of a cabinet, console, etc., and those interior surfaces that are prominently exposed to view when the doors are opened.

Rework. A procedure applied to a nonconformance that will completely eliminate it and result in a characteristic that conforms completely to the drawings, specifications, or contract requirements.

1. Requirements

1.1 Acceptable rework procedures are divided into the following subparagraphs:

Printed Wiring
Wiring and Connectors
Touch-Up, for Protective Finishes at Assembly Level
Welds and Welding
Part Marking
Open Zipper Tubing.

During rework operations, care shall be taken to protect surrounding or adjacent equipment from becoming damaged or contaminated by solder splashes, flux splatter, wire and insulation clippings, and metal chips from filing, drilling, cutting, grinding, etc. The precaution is of particular importance when performing rework inside assembled chassis, cabinets, consoles, and cockpits containing printed circuit board assemblies, electrical connectors, unsealed relay contacts, bearings, motors, etc.

1.2 Printed wiring.

- a. Etched letters and/or numbers on printed wiring assemblies.
- (1) Remove remaining characters in specific series being replaced.
 - (2) Stamp letters or numbers.

- b. Warped printed boards. (NOTE: Not applicable to Support Operations/ Field Service personnel.) Warped printed wiring boards with or without components may be treated in the following manner:
- (1) Place the preheated bare board or preheated assembled board between preheated steel plates or in a suitable straightening fixture. Preheat boards and plate to 240 °F (115 °C) for bare board or 215 °F for assembled boards.
 - (2) Clamp with sufficient force to hold board flat between the plates. In the case of the assembled board, the plates should be arranged in such a manner that only open areas of the board free of components are in contact with the clamping fixture.
 - (3) Place in oven at the following temperature-time cycles:
 - (a) Bare Boards: 240 °F (115 °C) to 300 °F (150 °C) for approximately 2 to 10 hours.
 - (b) Assembled Boards: 215 °F (115 °C) for 2 hours to overnight.
 - (4) At completion of the oven cycle, remove from oven and allow to cool in a dry environment to room temperature in the restrained condition.
 - (5) Remove from straightening device and measure the warp. Measure the warp again after 24 hours and before accepting the boards.
 - (6) Assembled boards which have been successfully straightened should be functionally checked to assure that components have not been damaged by the heat. Visually check to assure that conductors have not loosened.

- 1.3 Wiring and connectors.
 - a. Improperly located or damaged taper pins, connector contacts, and wirewrap pins.
 - (1) Improperly located taper pins.
 - (a) With proper removal tool, pull taper pin from incorrect receptacle.
 - (b) Check for damage to pin caused by removal. If pin is damaged, replace as follows:

Cut off old taper pin as close as possible to crimp.

Strip wire end to proper length.

Crimp another pin on wire.
 - (2) Damaged or incorrectly located connector contacts.
 - (a) Using the proper tool, extract contact pin from connector.
 - (b) Check pin for damage and replace if necessary.
 - (c) Insert pin in correct location using the proper tool.
 - (3) Damaged or incorrectly located wirewrap pins.
 - (a) Using the proper tool, extract wirewrap pin from printed wiring board.
 - (b) Insert pin in correct location using the proper tool.
 - b. Replacement or removal of wires terminated with taper pins.
 - (1) With proper removal tool, pull taper pins from receptacle and remove wire.
 - (2) If applicable, insert replacement wire into correct receptacles.

- c. Improperly located wire wrap.
 - (1) Using unwrap tool, unwrap wire to be removed from incorrect post.
 - (2) Cut off portion of wire that was wrapped on post.
 - (3) Strip wire end to proper length.
 - (4) Using the wire wrap gun, apply wire to proper post.

NOTE: If wire is too short to be reworked, replace entire wire.

- d. Replacement or removal of wire wrap.
 - (1) Using unwrap tool, unwrap wire and remove.
 - (2) If applicable, replace wire using wire wrap gun.

1.4 Touch-up for protective finishes at assembly level. To touch-up protective finished equipment that has been scratched, scraped, partially removed, or marred through rework, etc.

- a. All exterior (normally visible) finished surfaces that have been inadvertently scratched, scraped, etc., shall be either touched up or completely refinished, depending on the extent of damage.
- b. Protective finishes that have been partially removed or marred due to rework operations or operations required at final assembly such as trimming, filing, drilling, grinding, etc., shall be touched up.
- c. Touch-up of exterior (normal visible) organic finishes shall be accomplished using the final coating specified on the drawing.
- d. Paint finish touch-up. Touch up paint finished in accordance with **LMS 9-1**.
- e. Wrong color paint. Strip and repaint correctly in accordance with drawing specifications. (Fabrication Level)

NOTE: Paragraph 1.4f through 1.5b(4) are not applicable to Support Operations/Field Service personnel.

- f. Defective plating (insufficient, excessive, peeling, pitted, burnt, or wrong plating).
 - (1) Strip in appropriate solution.
 - (2) Replace in accordance with drawing specifications.
- g. Excessive marks on plating caused by plating contacts.
 - (1) Strip in appropriate solution.
 - (2) Replate in accordance with drawing specifications.

1.5 Welds and welding (prior to finish operations).

- a. Excessive welds and weld spatter.
 - (1) Remove weld excess and spatter by grinding.
 - (2) Clean and finish as required.
- b. Defective weld (crater, crack, porosity, weld crack, etc.)
 - (1) Remove defective weld by grinding, milling, etc.
 - (2) Strip finish, deoxidize, as necessary.
 - (3) Weld per **LMS 7-1**.
 - (4) Clean and finish as required.

- 1.6 Part marking.

Part marking incorrect. Remove incorrect marking with solvent or eraser and mark to drawing specifications.
- 1.7 Open zipper tubing.
 - a. If zipper tubing will not stay closed, first check to ensure that the tubing is the correct size for the application.
 - b. Close tubing by using the appropriate zipper tubing tool.
 - c. Apply sealant along seam where tubing was previously open.
2. Quality Assurance Requirements
 - 2.1 Reworked items shall be analyzed, inspected, and tested in the same manner as the original item.
3. Preparation for Delivery
 - 3.1 The preparation for delivery requirements of the original item shall apply in full to all reworked items.