

Instruction
Hardware Engineering

No. LMS 12-1

Subject: Preparation and Packing for Shipment

APPROVED BY Manager, Hardware Engineering

STATUS Maintenance Revision

PURPOSE Provides guidelines, procedures, and specific direction for Manufacturing to disassemble simulator systems and related assemblies in preparation for packaging and shipment; also recommends packaging techniques to prevent damage during shipment. L-3 Communications Corporation, Link Simulation & Training Division (hereafter referred to as Link) personnel shall follow this instruction when simulator systems and related assemblies are prepared for packaging and shipment.

AFFECTED FUNCTIONS Hardware Engineering
Manufacturing

REFERENCES None

DEFINITIONS None

INSTRUCTION

1. Requirements
 - 1.1 Preparation for packing.
 - a. Cleaning. The units must be clean before packing. If possible, use a vacuum cleaner to remove dust, dirt, and debris, rather than an air hose. Caution shall be exercised when vacuuming around printed circuit assemblies. The vacuum shall be properly grounded and a static wrist band shall be worn by the operator. A list of commonly used cleaning materials is shown in Table I. Note the remarks/cautions before using these cleaning materials on new applications.
 - b. When cleaning plexiglass, care must be taken to use only approved cleaning materials. Refer to Table I for proper cleaning materials.

- c. Preservatives. If necessary, a preservative shall be applied to unprotected metal surfaces. Preservatives shall not be used on mating surfaces such as the outrigger or mating halves of the frame.
- d. Lubricant. Never apply lubricant over a rusted or corroded surface. All surfaces must be clean and free from moisture, solvents, and other contaminants at the time of lubrication.

Table I Cleaning Materials and Solvents

| COMMON NAME | PURPOSE | DESCRIPTION | REMARKS/CAUTIONS |
|---|---|---|---|
| Scram | General purpose cleaner for removing oil and grime from a variety of surfaces. Will strip wax at full strength. | Alkaline soap, liquid; mix at 10 to 1, water-to-soap concentrate. | This material will dull lacquer finishes. Heavy concentrations will remove paint and may etch aluminum. |
| Naphtha | General cleaning of grease, oil, and tar from fabrics and painted surfaces. | Dry cleaning solvent. | Flammable liquid; will dissolve rubber. |
| Toluol (Methyl benzene.) | Dissolves glue and activates adhesive on tape. | Solvent. | Flammable liquid; poisonous fumes will damage plexiglass and removes lacquer. |
| 1-1-1 Trichloroethane | Degreases metals; cleans solder flux. | Solvent dry cleaning. | Poisonous liquid; damages plexiglass, dissolves plastic, special disposal requirements. |
| Kleenmaster brillianize (Link PN 118830) | Cleans plexiglass and plastic surfaces. | Commercial cleaner liquid; inhibits static. | |
| Mirror glaze, plastic polish No. 10 Plastic cleaner No. 17 | Clean and polish plexiglass. | Commercial polishing compound made by Meguiar's, Irvine, CA. | Abrasive. |
| Plastic cleaner | Clean plexiglass. | Commercial cleaner; static retardant; leaves no film. Miller Stevenson. | |
| Matthews ink thinner | Removes paper backing from plexiglass. | Commercial solvent for layout dye. | Poisonous liquid; flammable. |
| Isopropyl alcohol | Clean plastics; may be used on plexiglass. | Solvent. | Flammable liquid. |

- e. Preparation for packing. All units shall be approved by Quality Assurance as being ready for packing.
 - (1) Verify that the unit tag has been stamped by Quality Assurance prior to packing.
 - (2) If required, Government (DPRO) approval must also be obtained.

- f. Motion system unit.
 - (1) Hydraulic piping.
 - (a) All ends shall be capped and covered with plastic bags after ensuring that all the oil is drained.
 - (b) When the piping is shipped in sections instead of in individual pieces, no further preparation will be necessary.
 - (2) Stove pipe filters. After capping the outlets, the stove-pipe filters shall be wrapped in Kimpak or other suitable packing material, banded to the skids, and wrapped with plastic.
 - (3) Small accumulators. Small accumulators shall be packed the same as the stove-pipe filters. See paragraph 1.1d(2).
 - (4) Large accumulators. The gauges shall be removed and packed separately in small cartons which will be fastened to the accumulators. The accumulators will be fastened to runners to facilitate handling, and all openings will be capped.
 - (5) Manifolds. The units shall be secured to skids, all openings capped, and all gauges protected with padding.
 - (6) Junction boxes. The units shall be secured to skids, the cables rolled up on the same skid, and the light protected with padding.
 - (7) Motion pumps. Hydraulic fluid shall be removed from the motion pump and placed in a QA clean barrel and safety wired.

- The motion pumps shall then be secured to custom-built skids. The gauges shall be removed, boxed, and secured to the pump.
- (8) Air-conditioning units. The units shall be secured to custom-built skids and covered with Kimpak, or other suitable cushioning material, and cardboard for protection.
 - (9) Motion frame. When the frame is disassembled for shipping, check to ensure that all parts and hardware are packed and shipped with the unit. The frame halves may be strapped to the side of the truck without further preparation.
 - (10) Cylinder assembly. If the cylinder is not in a protected position, the transducer, when used, shall be detached from the cylinder assembly and packed separately in a small carton. This carton shall be secured in the same box as the cylinder assembly. Before packing the cylinder assemblies, all openings shall be closed off with plastic caps.
 - (a) The cylinder assemblies shall be supported by a base which is reinforced by supports that also serve as skids to facilitate handling with a forklift truck.
 - (b) Motion knuckles. The motion knuckles shall be removed from the cylinder assemblies and attached to shipping skids (Link PN 115116). The knuckles shall then be covered with a cardboard cover (Link PN 115115).
- g. Cabinets and consoles. Units that do not have rollers, are top heavy, or require hermetical sealing, shall be secured to a pallet or skid for forklift handling.
- (1) The units shall be examined for any components which are heavy or fragile and are not fully supported. Straps, blocking, and/or plastic foam will be added to provide complete support, as required. Particular attention should be given to the protection of cathode-ray tubes (CRT) by supporting the neck of the tube.

- (2) Memory units shall be removed and shipped separately. Extreme care must be taken to protect them. The original shipping containers should be saved and reused.
 - (3) Hinged panels and units mounted on slides shall be secured by straps or fasteners.
 - (4) Any opening shall be covered with cardboard or other means so that the padding is supported.
 - (5) Glass or plexiglass should be protected by covering with Kimpak, foam and cardboard, or similar material, and taped to hold in place.
 - (6) If required, the units shall be completely covered by Kimpak or similar padding material and securely taped. Otherwise, the units will be covered by furniture pads on the shipping van.
 - (7) Leveling bolts shall be completely up with jam nut tight or removed completely and packed.
- h. Cables. All connectors shall be capped or bagged for protection. The cables shall be coiled and packed in special cartons of triwall construction.
- (1) Cable list. A list of the cables will be made in duplicate, with one copy enclosed in the carton and the other copy taped to the outside.
 - (2) The cable cartons will be banded with steel straps.
- i. Visual system units. All visual CRTs shall be removed and packed in shipping containers, (Link PN 115235).
- Viewing heads shall be secured to custom pallets designed to support them during movement. The outside of the unit shall be covered with padding, and the entire unit covered with plastic sheet.
- j. Simulator cockpit. Because of the size and weight of the simulator cockpit, particular attention must be given to movement and handling, both from the standpoint of personnel safety and product safety. The

following list of handling procedures has been generalized to suit the most widely known situations. Exceptional situations should be brought to the attention of the Final Assembly supervisor.

- (1) Prior to disassembly.
 - (a) Final Assembly shall request the Maintenance Department to provide power lock-out. External power shall be turned off, locked, and tagged.
 - (b) Final Assembly shall also assure that all other potentially hazardous sources of power such as mechanical, hydraulic, pneumatic, etc., are turned off and/or disconnected.
- (2) Disassembly.
 - (a) Hydraulic and pneumatic lines shall be capped. (If new hoses are used, check the shelf-life sticker to make sure the date has not expired.)
 - (b) Cables must be stowed so that they do not impede movement.
 - (c) Dangling connectors and other loose items shall be secured.
 - (d) Glass and plexiglass shall be covered with Kimpak, foam and cardboard, or similar materials.
 - (e) Hinged units and slide-mounted units shall be secured by straps or fasteners.
 - (f) Heavy or fragile units not fully supported shall be strapped and/or blocked to provide full support.
 - (g) Every CRT shall be carefully supported, and the glass protected from damage.
- (3) Lowering cockpit. After QA and DPRO have given verbal approval for the cockpit, the following steps shall be followed

- when lowering a cockpit. (See paragraph 1.1j(5) for lift equipment requirements.)
- (a) Remove hydraulic cylinders using appropriate fixtures or rigged slings. The cockpit shall be supported with at least four aircraft jacks.
 - (b) Remove modular components that will not be shipped in place.
 - (c) Install shoring as required.
 - (d) Attach appropriate wheel assemblies for transport. Safe balance shall be maintained.
 - (e) Attach special support brackets, if available for the unit.
 - (f) Keep the center of gravity within the scope of the lifting device so that the load remains balanced. Make test lifts with each truck before the final lift.
 - (g) Identify and mark the lift points with arrows.
 - (h) Lift at marked lift points.
 - (i) Lower the cockpit to sit on the wheel assemblies.
- (4) Transporting. No personnel are permitted on the simulator while it is being moved.
- (5) Lifting cockpit. Use lift equipment within its rated capacity (forklift trucks with adequate load capacity for the simulator). Equipment must be fully charged and in good operating condition. If the equipment is leased, the inspection log shall be checked for the date of the last inspection. Use only qualified, Link-licensed forklift drivers for all forklift operations. The following steps shall be taken when lifting a simulator cockpit:

- (a) Keep the center of gravity within the scope of the lifting device so that the load remains balanced. Make test lifts with each truck before the final lift.
 - (b) Support the simulator at lift points.
 - (c) After lifting, place the cockpit on aircraft jacks or blocks to facilitate the removal of the cockpit wheel assemblies.
- (6) Loading the cockpit. Spot the simulator in proper relationship to the floor markings and proceed as follows:
- (a) Spot the truck in line with the floor guidelines to center under the load.
 - (b) Lift the simulator until it clears the flat bed and back the truck under simulator. Keep all unauthorized personnel clear while performing this operation.
 - (c) Install shoring, as required, to maintain stability.
 - (d) Secure the load to the truck (driver responsibility).
 - (e) Make sure that there are no loose items that can shift in transit.
 - (f) Label wrappings of top-heavy items to prevent problems during unloading.
 - (g) Pad sharp corners before covering with tarpaulins.
- (7) Simulator storage. When a simulator is being stored prior to shipment, follow the steps below:
- (a) Park components in designated staging areas.
 - (b) Do not block fire exits.
 - (c) Maintain at least 18-inch (46-cm) clearance under sprinkler heads.

- (d) Secure equipment to prevent it from falling or collapsing.
 - (e) Storage containers must be properly labeled and identified.
- 2. Quality Assurance Provisions
 - 2.1 The Quality Assurance Organization shall be responsible for assuring that the procedures in this instruction are adhered to.
- 3. Preparation For Delivery
 - 3.1 Cockpits may be shipped in one piece on a flatbed trailer. If so, they shall be blocked, chained, and strapped to the trailer. The cockpit shall be covered with Kimpak or foam and cardboard, and a waterproof material that is securely held in place.
 - 3.2 Some large cockpits may be split into sections and loaded in an enclosed air-ride van. Small cockpits may also be carried this way. The units should be fastened to runners or skids to facilitate loading and unloading. The units shall be covered with Kimpak or similar material and taped securely.