

**MILITARY STANDARD
MOBILE COMMUNICATION-ELECTRONIC
EQUIPMENT DESIGN CLASSES**

MIL-STD-689(EL)

23 April 1963

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C.

Mobile Communication-Electronic
Equipment Design Classes

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1. This standard has been approved by the Electronics Command, Department of the Army, and is mandatory for use by activities within the Department of the Army. All other military activities are required to employ this standard where suitable.
2. Recommended corrections, additions, or deletions should be addressed to Headquarters, U. S. Army Electronics Materiel Support Agency, Fort Monmouth, New Jersey.

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The communication-electronic (c-e) program for military mobility is producing two major equipment design classes: shelter-installed class for equipment destined for shelter and trailer van assemblies, and vehicle-mounted class for equipments destined for combat vehicle assemblies (jeeps, personnel carriers, tanks, trailers).

A concentration of development effort on these two equipment classes under a uniform engineering approach is fully practical within the current state of the art and will be highly beneficial to development, fabrication, operations, logistic, and maintenance organizations.

Therefore, this standard has been issued to obtain this concentration of uniform design effort through:

1. Establishment of a common understanding of these mobile c-e equipment design classes between and among user, developer, and tester organizations.
2. Establishment of the development implementation process to assure full support of the mobile c-e equipment design program.
3. Establishment of a common engineering approach to each mobile c-e equipment design class to assure uniform adherence to essential design features without detriment of technological progress.

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1. SCOPE

1.1 Purpose. This standard defines and establishes two mobile communication-electronic equipment design classes as basic to the c-e development program, specifies the method of development implementation, and sets forth the engineering design approach that will be applied to the development of end-items of each design class.

1.2 Design classes. These design classes apply to the c-e equipment and the associated components which together provide the required c-e service when appropriately housed or mounted, inter-connected, and powered. They do not apply to the mobile housing; vehicles; air heating, cooling or conditioning equipment; or power generating equipment.

1.2.1 Shelter-installed, mobile c-e equipment design class. Equipment of this class shall be designed specifically for shelter and trailer-van employment in mobile c-e service. The equipment shall be mainly relay-rack cabinet type. It shall be supplied to the field as one or more chassis with front panel(s) and interconnection facilities. Throw-away shipping containers will be used for the transportation of this equipment to and from the site of installation and for retention of the equipment at stocking points. Non-expendable containers may be used for interchange of equipment between operation and maintenance locations. Transit cases may be used for special applications where equipment of this class must be used without the protection of the mobile housing. Such special applications shall be kept to the absolute minimum and must be adequately justified when required.

1.2.2 Vehicle-mounted, mobile c-e equipment design class. Equipment of this class shall be designed specifically for combat vehicle employment. Unitized chassis construction will mainly be employed with front panel(s) and integral operating case(s) plus mounting base. Modular dimensioning of the units should permit installation of vehicular type equipment in relay rack cabinet facilities of shelters and trailer vans. This requirement will be waived when it would unduly compromise or detract from the primary vehicular application of the equipment.

1.3 Implementation. Implementation of this standard will be accomplished by three actions:

a. Use of this standard as guidance in connection with AR 705-5, Research and Development of Materiel; AR 705-6, Research and Development of Materiel (Type Classification of Materiel); AR 705-8, Department of Defense Engineering and Transportability Program; the Combat Development Objective Guide; and implementing instructions.

b. Specification of the design class(es) of this standard by development directives, Qualitative Materiel Requirements (QMR's), and other documents pertaining to specific c-e equipment that is to be designed for mobile service.

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c. Incorporation of the engineering design approach(es) of this standard within governing design specifications for specific c-e equipment destined for directed mobile service.

2. REFERENCED DOCUMENTS

2.1 The issues of the following documents in effect on the date of invitation for bids form a part of this Standard:

AR 705-5 Research and Development of Materiel.

AR 705-6 Research and Development of Materiel (Type Classification of Materiel).

AR 705-8 Department of Defense Engineering for Transportability Program.

AR 705-15 Operation of Materiel under Extreme Conditions of Environment.

AR 705-35 Criteria for Air Transportability and Air Delivery of Materiel.

AR 705-68 Radio Interference Reduction.

3. DEFINITIONS. Not Applicable.

4. GENERAL REQUIREMENTS. Not Applicable.

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5. DETAIL REQUIREMENTS

5.1 Mobile communication-electronic equipment design class, shelter-installed.

5.1.1 Performance. Equipment of this class shall perform all c-e functions as prescribed by the directive requirements for the specific equipment item when the equipment is within the mobile housing (shelter or trailer-van) or within an equivalent operational environment. It shall retain its functional capabilities during storage, and through all modes of field transportation (water, air, ground), in throw-away shipping containers, non-expendable shipping containers, transit cases, or mobile housings.

5.1.2 Equipment design. Equipment of this design class shall be mainly relay rack cabinet type designed specifically for shelter and trailer van installation, but may be used in such equivalent or less severe operational environments as semi-fixed or permanent buildings and hardened sites. Exception is allowed for peculiar requirements that demand dimensional deviation from this relay rack cabinet type for control consoles (preferably limited to the width of two relay rack cabinets for the sake of modular installation) and for other equipment accessories which might best serve installation needs, such as, free standing floor and wall mounted items. The relay rack cabinet equipment shall be composed of vertical or horizontal type chassis properly equipped with front panels and mounting facilities for front-loading into the mobile racking facilities. For the sake of inter-equipment standardization and for standardization of racking facilities, equipment chassis shall be dimensioned to: a standard depth of 23-1/8 inches from the face of the front panel to the rear (including rear cables (if any) and connectors); no protrusions from the front panel greater than one and one-half (1-1/2) inches; and the "19 inch" relay rack standard dimensions. (Use of other standards must be justified as a required deviation from directive requirements). This equipment shall be engineered towards the goal of providing for operational adjustment and in-service maintenance testing without the necessity of either partial or complete withdrawal of the chassis from the racking facility. Inter-chassis and inter-equipment connection facilities shall be at the rear of the equipment (or at least behind the front panel) except, as in the case of certain antenna connections, where such "behind panel" connection facilities would degrade the equipment performance. Equipment qualifying under aforementioned peculiar requirements shall be designed generally towards these same goals.

5.1.3 Configuration aspects. The overall dimensions and arrangement of chassis arrays shall take full advantage of the mobile housing facilities, yet possess sufficient flexibility to adapt to higher bay heights for semi-fixed and permanent buildings and hardened site installations.

Chassis and pre-assembled equipment arrays, if any, shall pass through mobile housing doorways with adequate clearance for safe installation and replacement. Chassis and pre-assembled arrays shall be designed towards a 50-pound weight limit and should rarely exceed 100 pounds. These limits shall be modified by density and shape factors as they apply to human handling capabilities. Whenever possible all items (including externally mounted components) shall be portable.

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Physical handling facilities shall be adequate for installation and replacement needs. Machine loading shall not be required for it is ordinarily not available in the field, and when used, has frequently been found to result in equipment and mobile housing damage.

5.1.4 Mobility aspects. The equipment shall be capable of being transported within its mobile housing under all carrier service modes: vehicle, cargo airplane and helicopter air transport in accordance with AR 705-35, "Criteria for Air Transportability and Air Delivery of Materiel."

Shipping containers shall provide the protection equivalent to that of the mobile housing in non-operating condition and thereby adequately protect the equipment during all transport and handling of the equipment when not in the mobile housing.

For those special applications permitted for this class of equipment, transit cases shall provide the non-operational protection and the operational environment afforded by the mobile housing.

5.1.5 Environmental aspects. The equipment shall meet the extreme operational, storage, and transit requirements of AR 705-15 "Operation of Materiel Under Extreme Conditions of Environment" when within the mobile housing and when handled without benefit of this housing in process of equipment maintenance.

The equipment shall be designed to meet the operational requirements of AR 105-68 "Radio Interference Reduction" when within the mobile housing or within the transit case, if any. This shall be accomplished by provision of suitable front panel design, aperture screening, shielding, filtering and radio frequency bonding, etc.

The chassis shall offer the least resistance to the natural flow of the ventilating air of the mobile housing. Localized ventilating systems provided as an integral part of the equipment shall be kept to a minimum. When provided, such localized systems must be compatible with the mobile housing system.

The equipment need be neither rain-tight nor water-tight. These properties are considered to be those of the mobile housing, the transit case, or the shipping container, whichever is being employed at the time of exposure.

5.1.6 Maintenance aspects. Design of equipments in this class will be such that maintenance requirements will be held to a minimum. Features will be provided for ease of maintenance as specified by the individual equipment QMR, the Technical Characteristics, the Technical Requirements, and any other pertinent directive design information.

5.2 Communication-electronic equipment design class: vehicle-mounted.

5.2.1 Performance. Equipment of this design class shall perform all c-e functions as prescribed by the directive requirements when the equipment is mounted upon or within the combat vehicle or within an equivalent operational environment. It shall retain its functional capabilities though

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subjected to all modes of field transportation (water, air, ground).

5.2.2 Equipment design. Equipment of this design class shall be unitized, common base mounted, designed principally for vehicle-mounted service, but may be used also for shelter-installed service.

It shall consist of one or more chassis, each equipped with front panel and integral operating case, and mounted as a unit upon an equipment base. This base shall carry the assembly interconnection facility and, in turn, shall be shock-mounted to the combat vehicle.

Each unit (or group of units) shall be modularly dimensioned to enable insertion in the 19-inch racking facility of a mobile housing. The equipment air system of each unit shall be compatible with the air system of the mobile housing. These are the minimum design requirements that must be met for shelter-installed service.

Design consideration for shelter-installed service shall extend beyond these minimum requirements with the intent to achieve this service adaptability with minimum use of specialized adaption facilities. Such features shall not be provided that either degrade the vehicle-mounted service or unjustifiably increase the equipment cost.

5.2.3 Configuration aspects. The overall dimensions and arrangements shall be designed to take full advantage of the vehicle mounting space.

Physical handling facilities shall be provided on the basis of weight and human capability (1-50 lbs, one man carry; 51-100 lbs. two man carry). No field non-separable unit should exceed 100 lbs. This requirement will be waived only when it would unduly compromise or detract from the primary application of the equipment.

5.2.4 Mobility aspects. The equipment shall be capable of transport when mounted upon or within its combat vehicle under all carrier service modes: cargo airplane, assault airplane, helicopter, rail, and ship.

Shipping containers shall contain a complete equipment with unit(s) and mounting base held separately.

Once in the field, the equipment shall be protected solely by the integral operating case whether mounted upon a combat vehicle or handled separately. (Mounting bases shall include protective handling features as required.)

5.2.5 Environmental aspects. The equipment shall be designed to meet the extreme operational and storage requirements of AR 705-15, "Operation of Materiel under Extreme Conditions of Environment." When mounted upon or within the combat vehicle it shall take advantage of the temperature environment afforded by the arctic winterization kit provided as standard equipment for the vehicle. Therefore, components within this environment need not be designed to operate at temperatures lower than -35 degrees F.

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The equipment shall be designed to meet the operational requirements of AR 705-68 "Radio Interference Reduction." This shall be accomplished by adequate aperture screening, shielding, filtering and r.f. bonding.

5.2.6 Maintenance aspects. Design of equipments in this class shall be such that maintenance requirements will be held to a minimum. Features shall be provided for ease of maintenance as specified by the individual equipment QMR, Technical Characteristics, Technical Requirements and any other pertinent directive design information.

6. NOTES

Notice: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

(Copies of this standard for military use may be obtained as indicated in the foreword to, or the general provisions of the Index of Military Specifications and Standards.)

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