

## **Environmentally Controlled Modular Shelters (ECMS)**

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The Satcom Scientific *ECMS* product line features the most cost effective and reliable mobile equipment and personnel shelters manufactured anywhere in the world. *ECMS* shelters are available in 8, 10, 12 14, and 16-foot lengths; they can be delivered empty or as complete turnkey systems with electrical wiring and environmental controls installed.

Each shelter is constructed of all-aluminum tubes and aluminum sheets that are welded to high impact resistant proprietary extrusions. The walls, floor, and ceiling are filled with two inches of a blown-in urethane insulating foam that provides an R factor of +14. The interior walls are then covered in sealed marine grade plywood and carpet. The equipment shelter is thermally insulated for maximum isolation from the outside environment, and allows greater than 25 dB sound isolation (at 1 KHz) from inside to anywhere outside the shelter.

A secured personnel door provides ease of access for operation and for equipment maintenance. The shelters can be configured for several versions of electrical power and signal interface panels. Air conditioning and heating systems are readily available, and range from single or redundant 13,500 BTU Roof-mounted systems to single or redundant wall-mounted units rated up to 58,000 BTU. The shelters can be equipped with lifting rings, tie down rings, and fork lift pockets.



## 1.0 SCOPE

This document contains a technical description of several types of environmentally secured equipment shelters built by Satcom Scientific, Inc. In most instances the equipment shelters meet or exceed typical specifications for transportable tactical equipment.

## 2.0 REQUIREMENTS

### 2.1 Dimensions (*Basic Shelter, Unmodified*)

<u>Exterior (Less Jack Adaptors)</u>	<u>Interior</u>
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#### ***8-foot Shelters***

Height:	86 $\frac{3}{8}$ " (Including Skids)	76 $\frac{3}{8}$ "
Width:	87"	81 $\frac{3}{8}$ "
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#### ***12-foot Shelters***

Height:	86 $\frac{3}{8}$ " (Including Skids)	76 $\frac{3}{8}$ "
Width:	87"	81 $\frac{3}{8}$ "
Height:	147"	141 $\frac{3}{8}$ "

#### ***16-foot Shelters***

Height:	86 $\frac{3}{8}$ " (Including Skids)	76 $\frac{3}{8}$ "
Width:	87"	81 $\frac{3}{8}$ "
Height:	196"	190 $\frac{3}{8}$ "



## 2.2 Weight (Basic Shelter, Unmodified)

<u>Shelter Size</u>	<u>Empty Weight</u>	<u>Capacity</u>
8-foot Shelter	2,049 lbs.	5,000 lbs.
12-foot Shelter	2,800 lbs.	8,000 lbs.
16-foot Shelter	3,560 lbs.	12,000 lbs.

## 2.3 Heat Transfer Coefficient

A two-part, 1.5 density, blown-in urethane foam is used to fill all wall, ceiling and floor sections. This foam has an overall thermal insulating R-Factor of +14. The foam not only provides thermal insulation, but also insures a rigid bond between the aluminum tubes and the exterior skins. Since the interior and exterior skins are attached to the tubes using a 3-M VHB (very high bond) tape rather than rivets, there is very little metal-to-metal conductivity between the interior walls and the exterior walls. Therefore, all Satcom Scientific shelters exceed the specification by having a U-factor of better than 0.35 BTU per Sq. Ft.

## 2.4 Towing Rings

Towing rings can be attached at the base corners of all shelters, conveniently located for towing the shelters over rough terrain. The towing rings are supported by 5-inch structural channel gussets that are welded to the opposing walls so that the weight is shared by all three wall sections. Each towing ring can withstand a 14,400 pound tensile load applied in any direction.

## 2.5 Lifting Rings

All shelters are equipped with four (4) lifting rings, one at each top side corner, to allow shelters to be tied down to a flat bed of a truck, or for hoisting the loaded shelters with overhead lifting devices or by helicopter. The towing rings are supported by 5-inch structural channel gussets that are welded to the opposing walls so that the weight is shared by all three wall sections. Each lifting ring shall also withstand a load of 14,400 pounds applied in any direction.

## 2.6 Lifting Jack Adapters

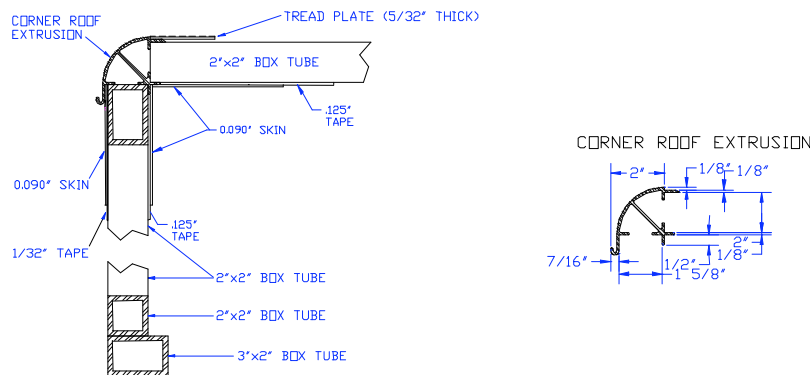
No jack adaptors are required.

### 3.0 CONSTRUCTION

All commercial shelters built by Satcom Scientific are made of 100% aluminum products. All hardware is made of high quality polished stainless steel.

Each shelter wall, floor and roof section is framed with 2-inch by 2-inch 6061T6 structural aluminum tube that is welded on all sides to form a frame with vertical tubes set on 16-inch centers. The exterior walls are then covered with a non-riveted 0.090" aluminum side wall skin. The skins are attached to the wall frames using a 3M VHB tape rather than rivets; therefore, the skins are never penetrated. The exterior of the roof frame is covered with 1/8" heavy aluminum 3003 *Treadbrite* plate which is fully welded to the roof extrusions. The *Treadbrite* plate is also taped to the roof frame tubes using the 3m VHB tape. The exterior of the floor section is covered with a 0.90" aluminum vapor barrier skin. The wall sections are then attached to the floor section using proprietary aluminum extrusions which are fully welded to the wall sections. The roof section is then placed on top of the wall sections and fully welded into place.

Aluminum corner caps are welded to the roof section, finishing the entire shelter. This fully-welded technique provides a rust-free unit impervious to adverse weather conditions and produces excellent EMI/RFI suppression. The shelter is watertight under all adverse weather conditions and the roof is designed to support a snow and ice load of more than 300 pounds per square foot. The roof can be walked upon and is strong enough to support the weight of two persons without distortion to any section of the roof.





### 3.0 CONSTRUCTION (continued)

The clear door opening is 35 inches wide and 64.5 inches high and is normally located in one of the short walls of the shelter. The door is watertight and has a two-point striker-type latching mechanism which can withstand a 100-pound load at the outer edge. The door is equipped with a latching feature that will hold it open if required.

The interior sections of the walls, ceiling and floor are filled with a blown-in two-part urethane foam which provides a thermal insulation property of +14, and acts as a rigid bond between the skins and the frame tubes. The foam is then trimmed, and  $\frac{3}{8}$ -inch sealed marine plywood is secured to the interior of the walls and ceiling. The interior floor section is covered with  $\frac{3}{4}$ -inch sealed marine plywood providing a floor that will support extremely heavy loads without using extra load frame plates. The floor is capable of withstanding more than 2,500 pounds over any 3 square foot area without causing any shelter distortion.

As an option, Satcom Scientific can provide any type of wall covering over the plywood. Durable rubber flooring is standard. Flame retardant carpet on the ceiling and walls is standard. Laminates for the walls and ceiling are optionally available.

### 3.1 FINISH

All exterior shelter surfaces shall be treated with an anti-corrosive primer and then painted with anti-corrosive paint to prevent adverse ambient effects. The following color schemes are normally used:

- Exterior: Desert Tan (FED-STD 595 Number 33531)
- Interior Ceiling: Semi-Gloss White (FED-STD 595 Number 27875)
- Interior Walls: Semi-Gloss Green (FED-STD 595 Number 24533)
- Interior Floor: MIL-C-22750 Coating, Epoxy – Polyamide, Lusterless gray, Color Number 36118.

The external material and its finish are such that it shall not crack or corrode, and shall be impervious to attack from insects. The walls, ceilings, and floors will not delaminate, deteriorate, or sag under continuous usage. There are no dissimilar metals used in Satcom Scientific shelters, and therefore no electrolytic corrosion protection is necessary.



## 4.0 ENVIRONMENTAL CONTROL SYSTEMS

As an example, all eight-foot and twelve-foot shelters equipped with three-phase (3Ø) electrical service include an environmental control unit with the following specifications:

- 220/380 Volts AC, 3-Phase, 50 Hz. (Other configurations are optional.)
- Cooling Capacity 21,300 BTUH. (Other configurations are optional.)
- Heating Capacity up to 12,800 BTUH, 5 KW.
- Remote Thermostat, Supply & Return Grills, Control Module with High Pressure Control, Low Pressure Control, Low Ambient Control, Alarm Relay and Rain Hoods.
- Evaporator and Condenser coils will be phenolic coated.
- All outside finishing shall comply with paragraph 3.8 of this document
- Sand filters provided on cold air output and return.

### 4.1 External Environment

All supplied equipment not installed in a suitable protected environment shall operate when subjected to the following:

Temperature:	-20° C. to +55° C.
Solar Radiation:	1100/Watts/square meter
Humidity:	Up to 100% including condensation below 30°, 98% at 30° C and 95% at 40° C.
Elevation:	Up to 3,000 meters (operational), 12,000 meters (non-operational).
Wind Velocity:	Up to 110 km/h operational (without tie-downs installed), up to 150 km/h survival (with tie-downs installed).
Rain:	100 mm/hr and 65 km/hr wind
Salt air and fog:	That found in coastal and desert regions, without corrosion or degradation of equipment operation.
Sand and dust:	As defined in MIL-STD 210C, with particle concentrations of 1.06 gm/cubic meter.

## 5.0 MODIFICATIONS

All 8, 12 & 16-foot shelters can be modified and equipped as follows:

- One (1) Waveguide pass-through (transmission line) cutout (size TBD)
- One (1) Signal entry panel (I/O panel) cutout (size TBD)
- One (1) Power Interface Panel
- One (1) Power Panel Grounding Connector
- Two (2) HPA Air Intakes with Hood and EMI/RFI & Sand Gaskets
- Two (2) HPA Air Exhaust with Hood and EMI/RFI & Sand Gaskets



## 6.0 ELECTRICAL

Depending on the local power grid, all 8-, 12- & 16-foot 3Ø shelters will be equipped with electrical components as follows:

- One (1) Square D QO310018 220/380 V Breaker Panel
- One (1) Square D 3Ø, 100-amp Main Circuit Breaker
- Three (3) Square D 3Ø, 20-amp Circuit Breaker
- Three (3) Square D 1Ø, 15-amp Circuit Breaker
- Four (4) Square D 1Ø, 10-amp Circuit Breaker
- Double Wire Trays on side walls & rear of shelter.

### 6.1 External Grounding

One (1) Brass ¼" x 20 stud will be located on the power panel for grounding.

### 6.2 Lighting

*8-foot Shelters* – 1 Low silhouette 40 Watt florescent fixture with line filters.

*12-foot Shelters* – 2 Low silhouette 40 Watt florescent fixture with line filters.

*16-foot Shelters* – 2 Low silhouette 40 Watt florescent fixtures with line filters.

## 7.0 QUALITY ASSURANCE PROVISIONS

All items shall be delivered in accordance with these specifications and are subject to inspection at source by buyer. Inspection shall be performed on final configuration prior to delivery. Any Satcom Scientific requirement not inspected by buyer shall be delivered with a Satcom Scientific certificate of conformity to the applicable specifications. All vendor equipment will be delivered with a certificate of conformity to the applicable specifications.

### 7.1 Drawings

Satcom Scientific will provide complete CAD drawings of the equipment shelter and all modifications made to the shelters.



## **7.2 Hazardous Materials**

There shall be no Class 1 Ozone depleting chemicals (ODCs) in products delivered by Satcom Scientific or required to be used as part of any end user operations, repair, maintenance or support procedures.

## **7.3 Identification and Markings**

Nameplates and Product Markings shall be in accordance with best commercial practice. All product markings shall be in English unless otherwise stipulated.

## **7.4 Workmanship**

Workmanship shall be in accordance with good commercial practice. Particular attention shall be given to neatness and thoroughness of items such as soldering, marking of parts and assemblies, wiring, welding, brazing, plating, riveting, finishes, machine operations and screw assemblies. Burrs, sharp edges, or any other damage or defect that could make the part or equipment unsatisfactory for the operation or function intended or distract from appearance (where a factor) shall be corrected.

## **7.5 Safety**

The design of the equipment shall contain safety features which reduce or eliminate hazards to personnel but do not impair equipment efficiency or operational capabilities. The safety objective shall be to minimize the possibility of personal injury during installation, operation and maintenance. Warning signs provided shall be in English. Equipment controls, access areas, edges, corners and power service devices shall be proofed against dangerous operation or contact. Electronic and electrical hazards shall be eliminated or controlled using the requirements of MIL-STD 454 as a guide.