

## Compact Mobile Terminal (CMT)



### 2.4M C/X/Ku-Band Trailerized Earth Station



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## 1.0 Physical Description:

**1.1.1 Overview:** The CMT is designed to be a self-contained mobile earth station terminal ready to accept customer supplied electronics. The CMT is capable of being towed by any commercial or military vehicle, or can be transported safely by truck, rail, ship or aircraft. The CMT is equipped with an on-board power generating system and an environmental air handling system for the rack area.

**1.1.2 Size:** The CMT is built on an all aluminum transport frame that is eight (8) feet wide and features two **TORFLEX** torsion bar suspension type axles rated at 3,500 pounds each. The axles are equipped with four G78-14 ST heavy duty trailer tires. When the tongue assembly is entirely removed for air shipment, the overall unit length is ten (10) feet and five (5) inches. The lowest part of the trailer deck is thirteen (13) inches above ground level to provide a low center of gravity and increased handling stability during high speed travel. The longest dimension when the trailer tongue is attached and configured for towing is fourteen and one-half (14-1/2) feet along the axis of travel.

**1.1.3 Weight:** The completed, rack-ready CMT vehicle weighs 2,500 pounds. The tongue weight of the unit is approximately 450 pounds.

**1.1.4 Composition:** A major design goal in the development of the CMT product line was to achieve a high degree of structural strength and integrity at a low weight. The trailer frame is constructed of 6063-T5 type-AA six-inch structural channel aluminum which has the same strength and load bearing capacity but none of the corrosive properties associated with steel.

The equipment shelter is framed with two-inch (2" x 2" x .125") 6063-T5 square aluminum tubing and covered with a non-riveted skin of .090 aluminum. The interior wall section is then covered with a blown-in urethane foam which provides an R-factor of +15. Another .090 aluminum skin is used to seal the inside wall section. Each wall section and the roof rails are fitted to locking extrusions, and are welded in place to add strength and rigidity to the shelter. The roof section corners are also fitted with welded caps. The resulting structure, in our opinion, not only provides superior rigidity, but also increases insulation and improves structural integrity.

The entire trailer and equipment shelter is etched, primed, and painted with two coats of white polyurethane enamel.



## 1.2 Transportability:

**1.2.1** The CMT trailer is designed to be towed safely at speeds of up to 55 MPH on paved roads or highways. The CMT can be towed over rough terrain or unpaved roads as long as safe towing speeds are maintained. Always refer to the tow vehicle manufacturer's specifications for maximum towing weight and towing configuration. The CMT vehicle meets or exceeds all Federal Highway Administration regulations for interstate transport and Department of Transportation guidelines as set forth in Title 49, subparts B, C, E, F, and J.

**1.2.2** The CMT trailer incorporates dual, torsion bar suspension axles each rated at 3,500 pounds. These axles are fastened to a six-inch aluminum structural channel frame to provide a smooth, low vibration ride for electronic components. Tire ply and size is sufficient to support weights up to the limitations of the axle sets. Both axles are equipped with hydraulic surge brakes that will greatly reduce stopping distance and enhance over-the-road travel safety and handling.

**1.2.3** Brake lights, running lights, and turn signal indicators are included on the trailer, recessed and flush-mounted into the shelter. A quick-disconnect 24-volt DC military connector is supplied with each vehicle for connection to the tow vehicle tail light circuit.

**1.2.4** The trailer tow bar is fitted with a lunette eye which is used when the tow vehicle is equipped with a pintle hook. A breakaway at the end of the tongue assembly allows quick installation of either this type or another type of device: a  $2\frac{5}{16}$ -inch coupler can also be used with a Class III hitch and ball. The hitch coupler is adjustable for tow heights of twenty (20) inches to twenty-seven (27) inches, accommodating military and commercial type tow vehicles.

**1.2.5** The trailer tongue is entirely removable from the trailer frame and stows away in a compartment for compact air mobility. The trailer tongue assembly is constructed of 1/4-inch wall, 2-inch by 4-inch rectangular steel tube, and is installed onto the trailer by sliding the tongue assembly into a 2-1/2 inch steel tube that is secured to the structural frame of the trailer in two different locations. [See drawing CMT 93-3, **Removable Tongue Assembly**].

**1.2.6** When the tongue is installed for towing, it is positively locked into the proper position by installing the two tongue locking pins. A quick disconnect hydraulic fitting is supplied that allows the surge actuator on the tongue to be uncoupled from the axle brake lines. The brake system does not have to be bled when the tongue is removed or replaced.



### 1.3 Mechanical:

**1.3.1** Four permanently-mounted, microprocessor-controlled, electrically-activated stabilizer mechanisms have been outfitted to the corners of the vehicle to provide automatic or manual leveling of the vehicle and additional antenna stability during high wind conditions. The stabilizers are recessed on the underside of the vehicle to preclude protrusion greater than two (2) inches below the vehicle when retracted, but they will have sufficient displacement to level the vehicle on any axis to compensate for up to 5° of slope. The jacks are controlled from a panel located in the power compartment. When set in the automatic mode, the control panel allows the jacks to be automatically deployed and stowed. In areas of very uneven terrain the jacks can be manually adjusted for a maximum degree of level and stability.

**1.3.2** A 6500 BTU air conditioning system is included that distributes cooling air over the equipment racks. The air conditioning system includes a vent tube to drain condensate from the equipment shelter.

**1.3.3** Sling hook eyelets have been mounted to appropriate frame members near the four outside corners of the trailer for movement by crane or other upward-lifting devices. These eyelets are also used as tie-down points when the trailer is transported by truck, rail, ship or aircraft. The eyelets are reinforced to the frame and will withstand a force three times the weight of the CMT vehicle. Tie-down points are also located on the left and right sides of both of the axles, and are accessed from the left and right wheel wells.

### 1.4 Electrical System

**1.4.1 Utility Power System:** The *Satcom Scientific* CMT (Compact Mobile Terminal) can be operated from any 120/220 VAC single phase utility power source from 47 to 63 hertz. A Voltage regulator or UPS system can be quoted as an option.

**1.4.2 Power Panel:** Metering of voltage, current and frequency is provided at the power interface panel. An AC Voltmeter, Frequency Meter, and Ammeter are part of the panel so that inbound power can be monitored by the operator. The power inlet is a 115 VAC, 50-amp stainless steel marine connector, and a 50-foot SO#4 cable is supplied with a mating plug for the power inlet. There are circuit breakers for AC trailer lighting, Antenna Motors, Antenna Control and GFI outlets located on the trailer.

**1.4.3 Diesel Generator:** The CMT features an on-board 7KW (8KVA) diesel generator that is rated at 7,000 watts continuous. The generator is powered by a 4-cycle, water cooled engine. The generator is mounted on a slide-out shelf for ease of maintenance. A 20-gallon fuel tank is included which is mounted underneath the trailer. The tank has fuel drains for ease of service. The generator uses fuel at a rate of 0.64 GPH at full load.



## **1.5 Compartment Design:**

**1.5.1** The shelter has two free storage compartments. Each of the two compartments has a clear opening of just over 12-inches high by 45-inches wide by 24-inches deep. These compartments are on the left and right side of the CMT. These two storage compartments are fitted with watertight doors featuring continuous stainless steel hinges and locking, flush-mounted handles. Both of the storage compartments are designed to support weights of up to 300 pounds per compartment. Tools, cables, spare parts, alternate feed systems or other components may be housed in these compartments.

**1.5.2** A 12-inch by 14-inch door is located on the curbside rear of the trailer that covers the compartment which houses the Input/Output panel for signal interface cables. The Input/Output panel facilitating the common connection point for all communications support cables is also weather-protected, and is delivered with a blank .090 aluminum panel. The compartment is designed so that a digital telephone can be stored in the Input/Output panel.

**1.5.3** If supplied, a diesel generator is isolation mounted to the CMT frame and is housed inside a sound attenuated compartment located in the front of the CMT, on the street side (left side) of the trailer. The generator compartment is fitted with two large doors, one for access to the front of the unit, and one for access to the street side of the unit. These doors allow the operator to service and maintain the generator air and oil filters, the battery and the oil drain.

**1.5.4** The electrical power system for the CMT vehicle is located in the forward curbside (right side) compartment. The automatic voltage regulator is located in the lower section of the compartment, and the operator control panel is in the upper half. All system circuit breakers, generator controls and leveling system devices are located in this panel.

**1.5.5** A large door in the front of the trailer, over the tongue, allows access to the antenna azimuth motor drive and electrical system conduits. When the unit is to be configured without the tongue, the tongue is stored inside this compartment.

**1.5.6** Access to the electronic equipment is provided through a large door located at the rear of the unit. This door is hinged at the top using 1/4-inch stainless steel hinge, and is held open with mechanical type interlock arms at each end of the door. This compartment is sealed air and water tight, and is double insulated for maximum protection of the mounted electronic equipment. The compartment is capable of housing three 30-inch tall equipment racks for mounting any customer supplied electronics.

**1.5.9** All of the doors covering the compartments are fitted with keyed-alike locks that provide a two-point positive closure when actuated.

## 1.6 2.4-Meter Multiband Antenna System

**1.6.1 Antenna Reflector:** The 2.4-Meter Offset antenna reflector is manufactured by Vertex/RSI, and consists of a 2.4 meter offset reflector and several palletized feed systems. The antenna system is permanently mounted to the top of the trailer and stows in a face-down, clam shell fashion on the roof of the trailer during transport and storage. The reflector is a precision hydro formed 2.4 meter offset fed solid surface aluminum reflector that has inherently low sidelobes by virtue of full offset feed system which eliminates feed and spar blockage. No assembly of the antenna system is required since the feed spar is hinged, and automatically retracts into a locking point on the roof of the trailer as the reflector is stowed. The feed spar is designed to allow the direct mounting of the customer supplied LNA, LNB or other electronic components. The antenna is supplied with a structure that will support the weight of most TWT amplifiers from the 100 to 400 watt power range. The antenna back structure can serve as a plenum, allowing the heat diffused from the tube to be used for de-icing purposes.

**1.6.2 C-band Feed:** The 2-port C-band feed is built by Vertex/Gamma f and is manually selectable from Linear to Circular polarization. The transmit flange is WR-137 and receive flange is WR-229. The 2-port feed will provide 35 dB (on axis) crosspol isolation. The antenna provides 41.9 dB of transmit gain from 5.850 – 6.425 GHz and 38.2 dB of receive gain from 3.625 – 4.200 GHz. The RX to TX isolation is 80dB; the TX to RX isolation is 23dB. The axial ratio of the circular feed is 1.4:1.

**Ku-band Feed:** The 2-port Ku-band feed is also built by Vertex/Gamma f and is linear polarized. The transmit and receive flanges are WR-75. The 2-port feed will provide 35 dB (on axis) crosspol isolation. The antenna provides 49.0 dB of transmit gain from 14.0 – 14.5 GHz and 47.4 dB of receive gain from 10.95 – 12.75 GHz. The RX to TX isolation is 35dB; the TX to RX isolation is 25dB.

**X-band Feed:** The 2-port X-band feed is built by Vertex/Gamma f and is circularly polarized. The transmit flange is WR-90 and receive flange is WR-90. The 2-port feed will provide 35 dB (on axis) crosspol isolation. The antenna provides 44.4 dB of transmit gain from 5.850 – 6.425 GHz and 43.8 dB of receive gain from 3.625 – 4.200 GHz. The RX to TX isolation is 25dB; the TX to RX isolation is 35 dB. The axial ratio of the circular feed is 1.2:1.

**1.6.3 Antenna Positioner:** The antenna system is attached to an elevation over azimuth mount that is an integral part of the antenna system. The pedestal is driven by harmonic drives that provide smooth and even movement in azimuth and elevation. The pedestal allows for an elevation range of 0° to 65°. The azimuth travel range is  $\pm 90^\circ$ , either side of center. The feed polarization is motorized and its range is  $\pm 90^\circ$ . The pedestal is designed for survival wind loading of 65 mph, operational at 45 mph.

**1.6.4 Antenna Controller:** An RCI 3000E automatic antenna controller is supplied that provides control for the antenna system. Display of azimuth, elevation and polarization position, as well as other system information is provided via a front panel LED display. The RC 3000E provides an *auto-deploy* and *auto-stow* feature that will automatically deploy and stow the antenna. An optional step-tracking package is available with Flux Gate Compass, GPS Receiver and an L-band Beacon Tracking Receiver.