

Case Study: Portable Telecommunications Base Station

Client: Telecommunications electronics hardware developer and manufacturer

Client Problem: Integrate custom designed wireless telecom network electronics into a portable, robust base station for harsh field application. This base station unit must be a lightweight, self-contained, and compact unit with two person transportability, withstand shock and vibration, capable of high heat dissipation, and protection when used in dirty and wet environments.

GEOMETRIXDESIGN Solution: Utilize a commercial heavy-duty waterproof carrying case and a lightweight interior rigid frame structure with isolation mounts to provide shock and vibration protection. The telecom network, controller, and power electronics are contained in separate modules with card guide insertion into the structure for simple system reconfiguration. Cooling fans on both sides provide efficient thermal dissipation.

Design Details: Three subsystems were identified in the design of this portable base station:

- Modules for the wireless transceiver, controller, and power electronics
- Support structure for the mounting and shock protection of the modules
- Exterior case for carrying, weather proofing, and electrical and thermal access

These three subsystems were all dependent as the electronics defined the module sizes, which defined the support structure size, and which defined the case size. Also, the final size and weight of the base station was for two person portability.

A commercial rigid structural foam PP case with dimensions of 25"x20"x14" and weight of 25 lbs was selected to develop the base station product. The case dimensions and weight were sufficient for the base

station portability requirement. The case had a hinged, watertight lid with multiple heavy securable latches. Large handles provided two person lifting and wheels and retractable handle provided for single person rolling. The high strength rigid structural foam PP was dent and crack resistant, and allowed for customization for through-case access for fans and connections.

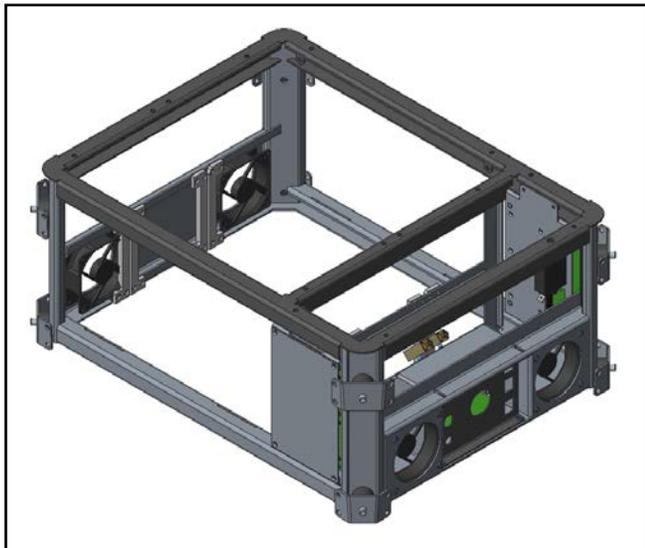


Model of portable base station

A rigid and lightweight frame was required for mounting the electronics modules and provide impact and vibration protection during handling. A robust card guide mount was used for quick module insertion/removal. EPDM isolation mounts suspended the frame in the case to damp impacts and vibrations.

A sheet metal design was used for the support frame. As weight, metal oxidation, and cost were a concern, aluminum (5052-H32) was selected for the support frame. Aluminum provides significant weight savings, is non-corrosive, and moderately priced.

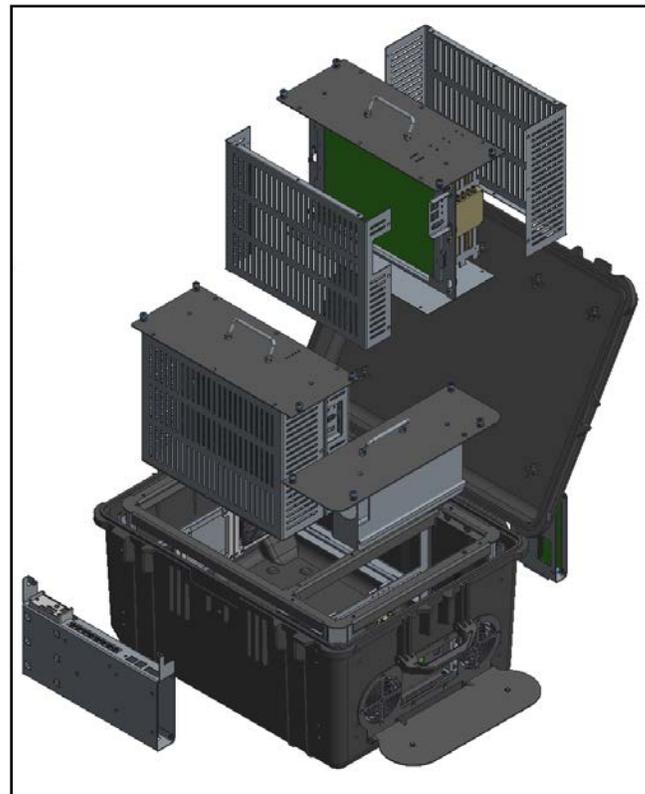
To improve strength and reduce welding, a unified frame design with only three separate sheet metal components used structural bends for strength members in the frame. Top and bottom components were designed from a single aluminum sheet and formed as beam members. Four vertical structural columns were welded at the corners to complete the frame. The



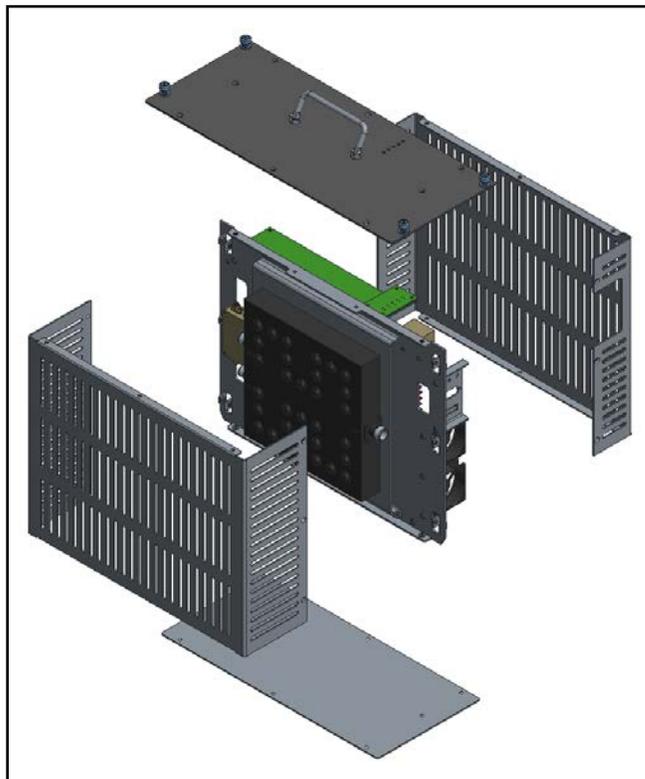
Model of unified frame with isolation mounts, fans, and power supplies

unified frame design allowed for the attachment of card guides, mounting fixed electronics, and routing of interconnect cables. The isolation mounts between the frame and the case were mounted interior to the vertical corner columns to maximize the frame size within the case.

Two types of modules were designed for mounting and connecting the electronics. A module design with card guide mounting and faceplate attachment was used for the primary transceiver and controller electronics and a module design with pin insert and thread attach was used for the signal distribution and power electronics. This design approach allowed quick insertion and removal of the primary electronics and semi-fixed mounting of the secondary electronics with close proximity and interconnection to the primary electronics.



Exploded assembly model base station with removable modules



Exploded assembly model of base station module

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