

CLAIMS

1. A field-assembled satellite communications terminal (101), comprising:
 - a. a plurality of discrete, modular aperture blocks (103), each aperture block containing:
 - 5 i. an electrically steered antenna aperture (105),
 - ii. a plurality of interconnection ports (107) for power and data communications between the plurality of aperture blocks, said plurality of interconnection ports (107) being removably connectable by the end user in the field,
 - 10 b. a signal processing system (325) for receiving, processing, and generating signals to and from the antenna apertures (105),
 - c. where the aperture blocks (103) are removably connected to each other in the field and self-configure to form a combined electrically-steered antenna, and
 - 15 d. a controller (339) within each of the plurality of aperture blocks (103) that automatically measures a relative distance and orientation between each block and each of its adjacent blocks to calibrate the combined electrically-steered antenna.
2. The terminal of claim 1, wherein said plurality of aperture blocks (103) are assembled to form a block assembly having a combined aperture formed by the plurality of antenna apertures (105).
- 20 3. The terminal of claim 2, wherein the combined aperture has higher gain, performance, and throughput.
4. The terminal of any of claims 1-3, where each of said plurality of aperture blocks contains integrated batteries and power control circuitry.
- 25 5. The terminal of any of claims 1-4, further comprising an external battery (433) that provides power through an interconnection interface.
6. The terminal of any of claims 1-5, where each aperture block contains computing devices (311) for communications and control between modules.

7. The terminal of any of claims 1-6, where one of said plurality of aperture blocks is jointly selected during configuration to act as a primary block.
8. The terminal of claim 2, where the block assembly acts as an integrated terminal, with modem and antenna control unit instantiated as part of the processing capability (329),
5 and position and orientation sensors (343, 345) provided by the plurality of aperture blocks.
9. The terminal of claim 2 or 8, where the block assembly acts as an integrated terminal, with modem, battery, antenna control unit, and position and orientation sensors provided by an external block.
10. The terminal of any of claims 1-9, further comprising a reconfigurable processing device or FPGA included in each of said plurality of aperture blocks.
11. The terminal of any of claims 1-10, where the aperture blocks are environmentally sealed within a housing.
12. The terminal of any of claims 1-11, further comprising an inductive power coupling (205)
15 providing wireless power transfer between the plurality of aperture blocks (103).
13. The terminal of any of claims 1-11, wherein the interconnection ports (107) have electrical contacts (283) for power transfer, and further comprising a removable cover to protect said electrical contacts.
14. The terminal of any of claims 1-13, where the interconnection ports use short-range
20 high-frequency wireless communications for data transfer.
15. The terminal of any of claims 1-13, where the interconnection ports use optical data couplers for data transfer.
16. The terminal of any of claims 1-15, further comprising one or more external data transfer and power accessories connected to one or more of said plurality of
25 interconnection ports for one or more of said plurality of aperture blocks.
17. The terminal of any of claims 1-16, where the electrically steered antenna aperture is a digital phased array.
18. The terminal of any of claims 1-16, where the electrically steered antenna aperture is an analog phased array.

19. The terminal of any of claims 1-16, where the electrically steered antenna aperture is a lens antenna array.
20. The terminal of any of claims 1-16, where the electrically steered antenna aperture is a liquid crystal-based antenna.
- 5 21. The terminal of any of claims 1-20, where each of the plurality of aperture blocks have a triangular shape with interior angles of 72 degrees, 54 degrees, 54 degrees.
22. The terminal of claim 21, wherein the triangular shape has rounded corners.
23. The terminal of any of claims 1-22, where the combined antenna aperture self-calibrates from internally or externally transmitted RF signals.
- 10 24. The terminal of any of claims 1-23, where relative position and orientation of the plurality of aperture blocks are determined for calibration by measuring optical path length differences by phase comparisons from one transmitter and at least three receivers for a high-frequency optically modulated signals.
25. The terminal of any of claims 1-24, where the terminal acts as a VSAT satellite communications terminal.
- 15 26. The terminal of any of claims 1-24, where the terminal operates in the commercial and military Ka-band satcom frequencies.
27. The terminal of any of claims 1-24, where the terminal operates in the Ku satcom frequencies.
- 20 28. The terminal of any of claims 1-24, where the terminal operates in the X-band satcom frequencies.
29. The terminal of any of claims 1-24, where the terminal can operate across multiple bands.

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