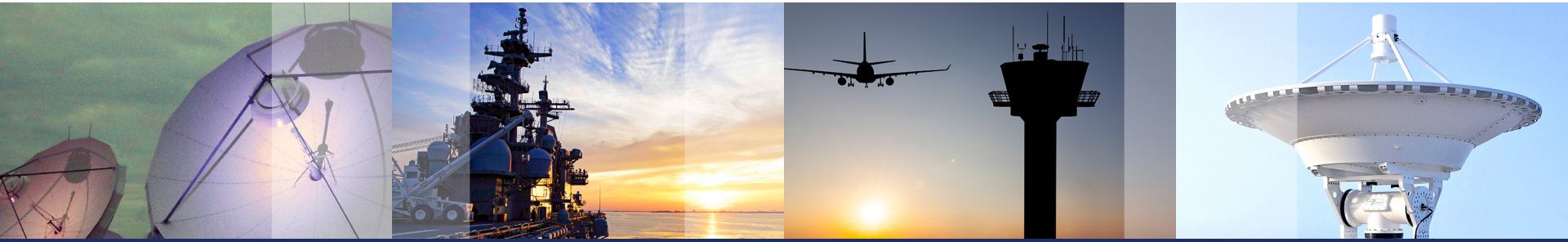
CPI Communications & Power Industries



CPI SATCOM & ANTENNA TECHNOLOGIES DIVISION

Orbital Systems Operations

Orbital Systems TRACKING OUR WORLD

Overview


Grønnlivegen


Grillsesongen er i gang 😄

Basic Facts & Figures

- Company Founded as Orbital Systems in 2004 in Irving, Texas to build antenna systems
- Initially co-located with sister company Quorum Communications, Inc. (founded 1988) that manufactured antenna systems RF and demodulator products
- Moved to current facility in 2007 to have adequate space for product fabrication
- Privately held until both companies were purchased by CPI in Aug 2018
- Fully merged together with CPI Satcom & Antenna Technologies, Inc. in March 2022
- Official name is CPI SAT Orbital Systems Operations
- Globally installed product base with over 350 antenna systems in the field since 2005
- Deployments in commercial, government and defense markets. Most sales commercial
- Antenna systems range from 1.5m – 7.3m and are intended for ground mounting

Combination of Innovation and Agility with Vast Experience and Capabilities

Product Applications, Markets, Technology

Orbital Systems Operations designs and manufactures LEO full motion tracking antenna systems for a variety of applications including:

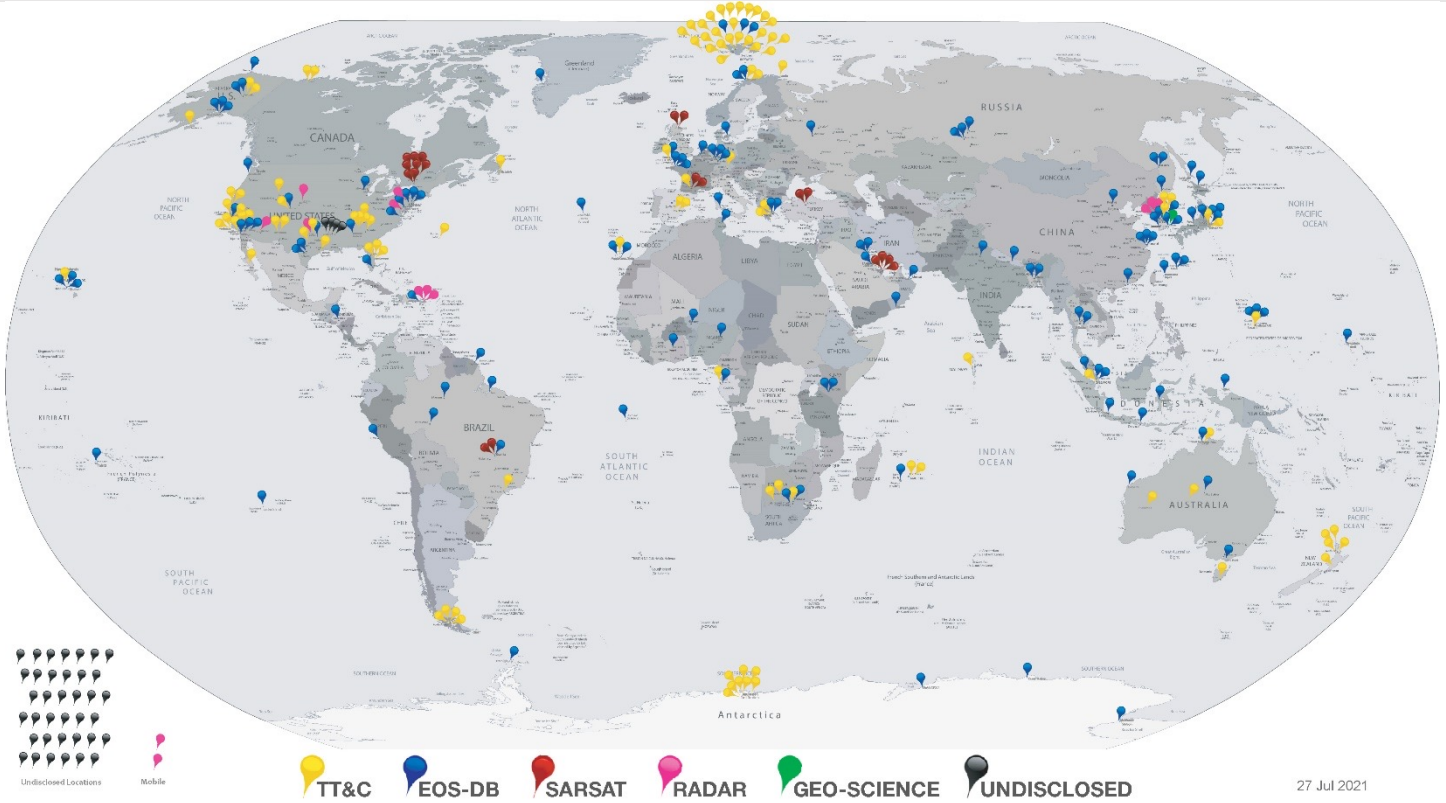
- LEO and MEO Telemetry, Tracking and Command Ground Stations (TT&C + Payload) in Small Sat and traditional Space markets, and also in Launch Tracking market
- LEO and MEO Satellite tracking and data collection systems (EOS-DB, EOS, SAR, and general scientific missions)
- Specialty positioner applications for systems integrators. Primarily for RADAR specialty market, but also for defense contractor projects

Antenna systems include many parts and subsystems, most are designed within Irving business unit:

- Positioners suitable for environmental operating conditions (wind, temp, etc.)
- Antennas including reflector, feeds, downconverters
- On board electronics including frequency converters, HPAs, ACUs, auto-track systems
- Monitoring and Control Software for antenna system and other customer provided equipment

Orbital is focused on antenna systems that are in the size range of 1.5m to 7.3m suitable for L, S, C, X, Ku and Ka band tracking applications

Antenna System Installations Map



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Antenna Positioners and Reflectors

Positioner Size and Reflector Size Options

- 7.3AE3BP-7.3m
- 5.0AE3BP-5.0m and -6.1m
- 3.0AEBP-3.0m, -3.7m and -2.8m
- 2.4AEBP-2.4m, -2.8m and -3.0m
- 1.8AEHT-1.8m and -1.5m

EOS-DB Reception System Overview

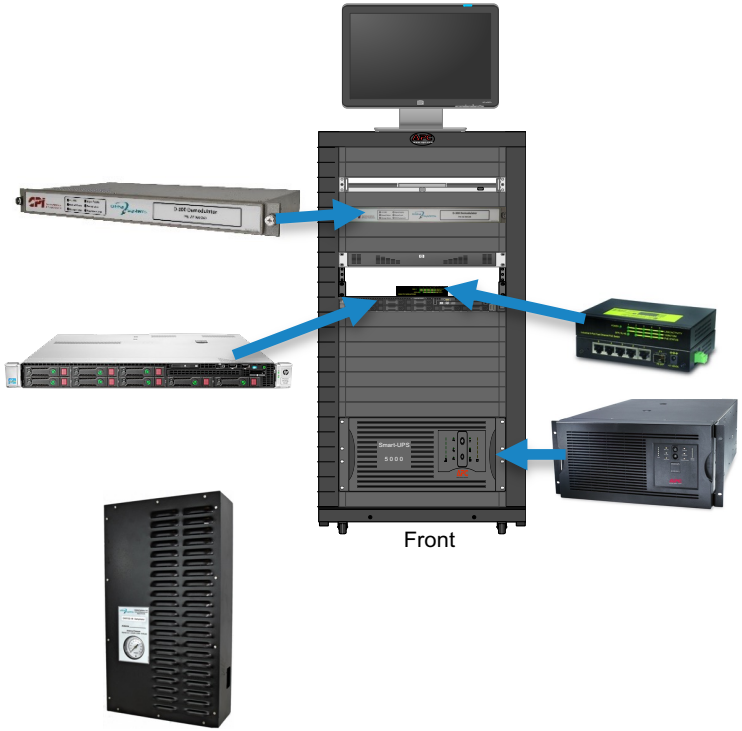
- EOS-DB Reception Systems: typically, 2.4m and 3.0m, X and L band
  - Application: Reception of direct broadcast, unencrypted medium resolution Earth Observation Satellites such as Terra, Aqua, SNPP, JPSS1, FY3 series, Future JPSS-2, METOP-SG A and B, etc. AND reception of weather forecasting satellites such as NOAA-POES, METOP A/B/C, DMSP (restricted to military only or open use at the poles), and many others
    - Customers: National Weather Services, University remote sensing research, Entities that support specific applications such as Firefighting, Fishing, Disaster management, etc.
    - Orbital Systems has made about 95% of all sales to this market globally for the past 5 years

2.4XLD EOS-DB Reception Antenna System

- 2.4AEBP-2.4m or 2.4AEBP-3.0m Antenna Positioner
  - 2.4m Reflector - solid single piece of spun aluminum
    - Optional 3.0m two-piece reflector available in spun aluminum or composite
    - Properly drained and designed to deflect rainfall from electrical components
  - Pressurization: Antenna positioner and feed are sealed and pressurized with dehydrated air to prevent internal condensing humidity and corrosion
  - ACU automatically manages internal humidity automatically
- Concentric X- and L-band Feed (coaxial waveguide)
  - Built in LNA/LNB and Downconverters
  - Built in diplexers combines X- and L-band IF signals onto a single coax
  - Optional S-band available with appropriate RF components
- Optional RF over fiber system

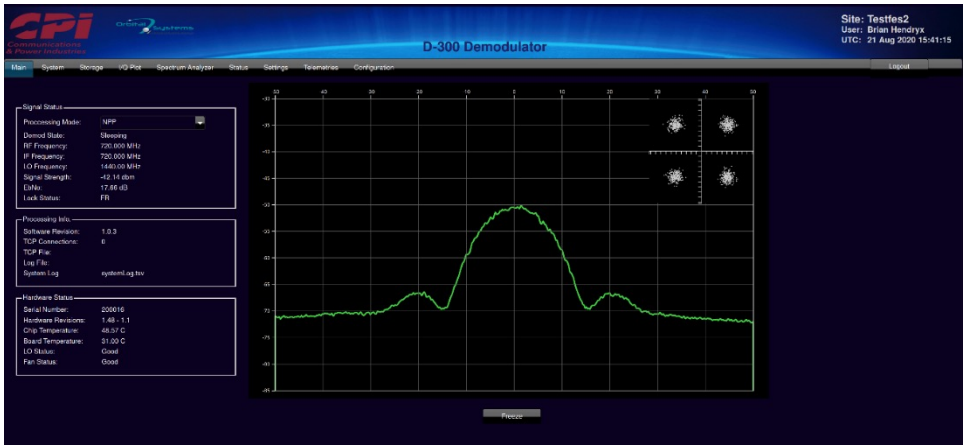
2.4XLD Indoor Components

- D-300 Demodulator
- Front End Server (EOS-FES) - Server hardware and software license processes data to L0 products
- DHR-150 Dehydrator - Wall or Rack mount version available
- Optional One-Half Rack lockable cabinet with Monitor, Keyboard, KVM switch, and 5KVA UPS capable of running Antenna system and rack components. Capacity for additional customer supplied high level data products server and historical data storage (not pictured).



D-300 Demodulator

- D-300 used in the EOS-DB market for medium and low-rate demodulation of direct broadcast satellites
- Software Defined Radio
- RF front ends on digital demodulators
- Remotely upgradeable
- Built in spectrum analyzer and scatter plot
- Data rates up to 400 Mbit/s depending on coding and modulation (100 Msym/s)
- 1 TB SSD onboard storage
- Very easy to add new satellites and modes
- Trade-in discount for returning old HRD/LRD demods when upgrading to the D-300

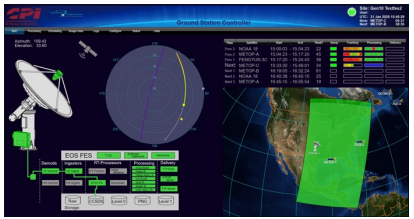


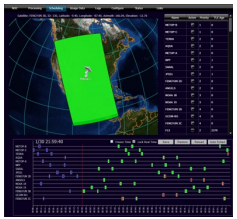
EOS Front End Server

- Provides automation and management tools required to capture and process remotely sensed earth observation data
  - Complete package preloaded with software allowing customers to quickly get their antenna system up and running
  - Auto scheduling and pass deconfliction
  - Data ingest process is automated and reliable
  - Produces industry-standard, level 0 files for all common EOS satellites
  - Provides pass logs with details and plots
  - Delivers data automatically to customer provided high level data products processing system and historical data storage
  - Linux operating system – CentOS 7 still used until end of this year, Rocky Linux 8 port 98% complete
  - Servers now shipping with Vmware ESXi (free license) on the bare metal
  - EOS-FES VM / DATA-FES SAN VM, with room for additional VMs

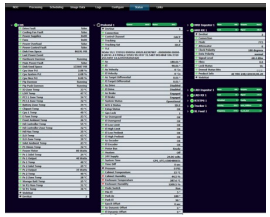
EOS-DB Software and Control Products

- EOS-DB M&C Software and Servers
  - Mature and recently updated software for monitoring and control of EOS-DB product line
  - Schedules and does deconfliction for multiple satellites by customer priority
  - Sets up antenna system, downconverters, demodulators for each pass and ingests data
  - Processes downlink data to L0 and delivers to customer destinations
  - Runs both generations of Orbital antennas and all generations of demodulators
  - Approximately 45 operational sites are using this software
  - Underlying software has had major rewrite for updated comprehensive Javascript GUI
  - Next phase is major upgrade in support of general device control for use as a general-purpose M&C package with the TT&C and Payload antenna market segment


NOC Main Screen


Scheduling


Satellite Pass Logs


Status

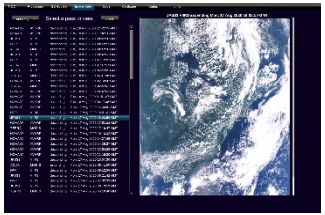


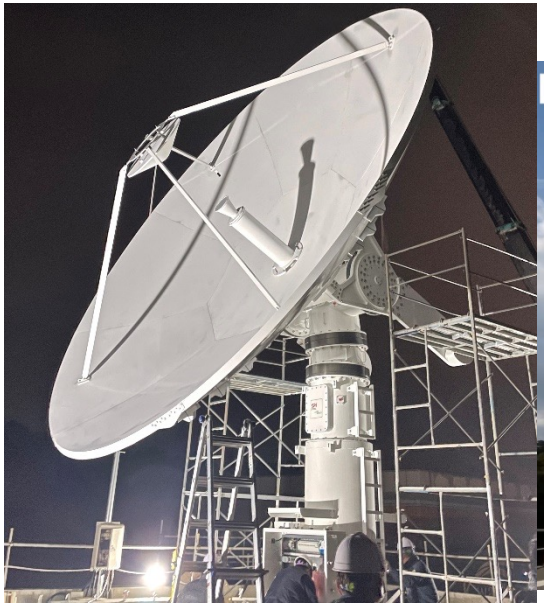
Image Data

Preparations for coming missions

- JPSS-2
  - HRD-200B demodulator can handle the data rate and may need a firmware upgrade for adding JPSS-2 mode
  - No other HW upgrades necessary
- MetOp SG A and B
  - Upgrade to D-300 demodulator due to the higher data rate
  - Feed upgrade necessary to open up the pre LNA filter from 120 MHz to 200 MHz – MetOp SG down link BW is 150 MHz
  - Feed can either be returned to the factory to be upgraded, or we can work with the customer remotely to assist with the filter upgrade
- FY-3E
  - Upgrade to D-300 demodulator due to the higher data rate
  - Feed upgrade may be necessary to open up the pre LNA filter from 120 MHz to 200 MHz. (TBC)

New Products: 7.3m antenna positioner

- First 7.3m system installed in South Korea at Kwater as an X-band RX only system
- Installation completed just before end of CY21, second system ready April 2022



Guiding Principles

- Customers come first at all times in both sales and service
- Fast response to customer inquiries and problems
- Very high system reliability and long service life
- Products that are easy to maintain and diagnose
- Lowest long term cost of ownership

We believe in understanding our customer's applications and designing our solutions using an open architecture and standards

For questions, please contact
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