A Modern Option for End of Life Antenna Control Systems

Leveraging the Radeus Labs 8200L as a Drop-in Replacement for the Vertex 7200 ACU

Is your business faced with a large group of (now obsolete) 7200 Antenna control systems and wondering what your next move will be? If this is true for you, you are also very likely asking yourself "what else will I have to change to accommodate a new solution?" Operator training and remote access may also be on your list of concerns. It was for these very reasons that Radeus Labs, Inc. undertook the development the RL8200L Antenna Control Unit to give customers with end of life Vertex 7200 Antenna Control Units an easy upgrade path to a modern and fully supported ACU. The RL8200L ACU is designed to be a direct drop-in replacement for the end of life Vertex 7200 ACUs. If you are looking for a path to refresh your ACUs and avoid the switching costs associated with modifying your infrastructure to accommodate a new ACU architecture, please read on!

In its time, the Model 7200 Antenna Control Unit was by many accounts, the best antenna controller on the market. It was loaded with features and presented a larger display than many of its contemporaries in the late 1980s. Many of these units have been in service for 20+ years --- well beyond their intended lifespan. In addition, the manufacturer made an "end of life" announcement in the spring of 2018. Thus, there are a growing number of aging antenna control systems in the field today in need of a refresh and without a trouble-free path to an upgrade. The RL8200L ACU by Radeus Labs was specifically designed for this purpose!

8200L Development
The 8200L was designed by the SAME team that designed the Vertex Communications 7200 to a person, so the design is solid and rooted in the same Engineering depth and expertise that went into the Vertex product many years ago. Developing the 8200L, however, had some distinct advantages as technology has made many advances over the past 2-3 decades. The design team has been able to leverage these advances for the 8200L, which were simply not yet available when the 7200 was developed.

Figure 1: RL8200L Drop-in-Replacement for Vertex Communications 7200 ACU

8200L ACU as a Drop-In Replacement
The form factor of the 8200L is a 4 rack unit design, the same as the 7200, in order to physically fit in the same rack space without issues. The 8200L does have an internal beacon receiver option, so if you needed

to consolidate rack space even further, that is possible with the internal receiver offerings in L, C, Ku, and Ka bands. The 8200L also takes advantage of lower power components and has produced a unit that consumes only 25 to 50 watts depending on configuration. This keeps your rack and the facility cooler and reduces power consumption by 50 to 70% when compared to older ACUs.

8200L Rear Panel Interface

The rear panel is designed with the same connections as the 7200 ACU to facilitate a quick one-to-one changeover of the ACUs. The 8200L will interface and operate with the existing 7150 drive cabinet and accommodates most of the position feedback devices deployed with these systems. Currently, there are options for size-11 resolvers and 4 additional optical encoder types. The 8200L also supports the operation of the portable maintenance unit supplied with the 7150 drive cabinet. The back panel interface for the 8200L maintains the same connections provided by the 7200 ACU yet also some modern and additional options for remote access of the system.
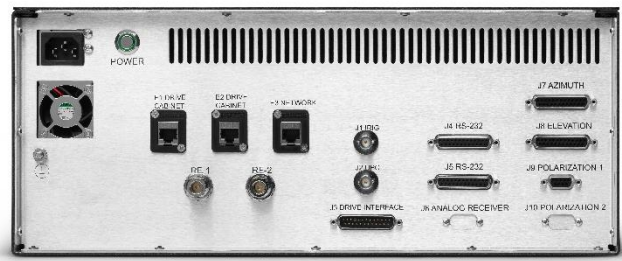
RL8200L Rear Panel View

Remote Access

There are several remote access options designed into the 8200L. First, the 7200 Serial M&C interface has been emulated with most of the commands being supported in the interface. Additionally, there is an SNMP interface option as well which provides a full-featured interface to the ACU operation. The MIBS are available in files contained on each ACU. SNMP provides a more modern interface option for customers that have the infrastructure in place to support this interface. Finally, the 8200L is equipped for access using VPN access through either Team Viewer or through Windows Remote Desktop applications.

Tracking Options

The 8200L sports several tracking and pointing options and is able to take advantage of some old methods in new ways to provide new options for antenna control. The basis for active tracking of many types is the step track algorithm for peaking the antenna signal strength over time. The 8200L step track algorithm is much improved over many existing step track algorithms in that it is very efficient in identifying the direction and number of steps to take in order to peak the system. Further, step tracks may be triggered by either a specified signal level drop or a time interval. This is useful for preventing wear and tear on your servo systems by operating only when required. Many targets will vary in their apparent movement depending on their orbital inclination and eccentricity. By using the power level trigger, the 8200L ACU only moves your antenna when it is needed, not just on a specified time interval. This minimizes unnecessary antenna movement and hence, wear on the antenna components.

Predictive Track is a model based tracking algorithm used by the 8200L to develop a model of the spacecraft orbit over time so that it can follow that model in the case of signal loss. Based on step track samples, the Predictive Track algorithm develops a model after it has accrued 24 hours of step track data.

There are two pointing modes available, IESS-412 (Intelsat-11 Element) and NORAD Two Line Element (TLE) modes. These two pointing modes are model-based pointing modes that do not close the loop using the satellite beacon. The 8200L will automatically refresh the data sets every 24 hours if configured with a target location for the new files. If the units are tied to the web, they will automatically go to a server location where Radeus provides the files. If the units are on a protected network (as most are) then the ACU may be pointed to an internal server which provides updated files to the ACU.

Two additional modes have been created using the IESS-412 and TLE pointing modes as a basis but with the addition of a velocity based step track to the operation. This allows for (typically) faster target acquisition and once the target is acquired, a step track operation is performed in order to maximize the signal and compensate for any offsets in the pointing model. The step track operation in this mode is different from the original version of step track in that it maintains the current velocity of the antenna as its base for steps. Meaning it will continue to follow the target path while stepping forward, backward and to each side of the target's path in order to peak the signal. Following a step track operation, it will then apply any determined offsets to the pointing model going forward, thus providing improved performance relative to the stand-alone pointing modes. Another benefit of using this mode is that you have a model available immediately to the ACU that can follow the target for 170 hours or more once the TLE or IESS-412 model has been loaded onto the ACU.

Other modes of operation include Move to Look Angles, Move to Longitude, Manual Jog and other modes commonly found on ACUs. The 8200L is very capable when it comes to providing tracking and pointing operations for your antenna systems.

User Experience and Interface
One of the major differences you will notice with the 8200L is the user interface. It was very carefully designed to give quick access to system parameters through a visually appealing touchscreen interface. This interface crisply displays necessary information for the user and the number of parameters required to set up the system has been significantly reduced through a clever architecture. The 8200L offers much quicker access to system parameters from the front panel than the 7200 was capable of providing with its 20 button keypad interface. The 8200L is designed to be simple to configure and simple to operate.

Switching/Hidden Costs
With any change in complex systems, there are typically either small, or large amounts of work to be done depending on how closely the new configuration matches the old configuration. Engineers and or Technicians cost money and the hours spent changing connectors, wiring, cabinets can run up quite a tab for the operations budget when changing out obsolete controllers. These sometimes hidden or "switching costs" are not always apparent or considered when contemplating the cost of a new ACU. When it comes to replacing the 7200 ACS, the 8200L nearly eliminates the switching costs altogether and is hands down the least cost route to replacing legacy 7200 ACUs. By maintaining the same

interface and pinouts, the 8200L can actually save you tens of thousands in cost over competitive replacement's solutions offered on the market today!

8200L ACU as a Spare for 7200/8200
As a value addition, the 8200L ACU may be used as an on-site spare for either the 7200 or the standard 8200 ACU. By simply unplugging a couple of internal Ethernet plugs, the 8200L will also function in the place of a standard 8200! This capability reduces the number of spare ACUs you may need to cover both 7200 and 8200 control systems for your Teleport, thus less capitol tied up in equipment that is only needed in emergencies.

Installation and Configuration
When replacing a 7200 with an 8200L, the setup process has been considered in the ACU design. With the 7200 ACU, the system dynamics had to be measured and then entered into the ACU for it to provide optimum tracking for a given antenna. The 8200L features a "Setup Wizard" which when run, will automatically measure the dynamics for a given antenna system and then apply those to the motion parameters for the system. Once the site coordinates are entered and the hard limit switches are installed for the antenna, the Setup Wizard will exercise the antenna to discover the hard limit locations, automatically set the soft limits for the antenna, measure azimuth servo bump and coast times, measure elevation servo bump and coast times, and update the motion parameters for the ACU to get the best performance possible for a given antenna system. The Setup Wizard feature provides a more consistent configuration from antenna to antenna since it measures and takes into account the unique dynamics of each antenna. The runtime for the Setup Wizard from start to finish will vary and is highly dependent on the antennas movement capabilities, but in some real installations it has been run and completed within 30 to 40 minutes. In that specific case, the entire change out took less than an hour to have the 8200L up and tracking a target with the antenna.

Training and Support
Radeus Labs conducts training courses at our facility just outside of San Diego, California and can also provide remote training classes depending on the scenario. Product support is cultural at Radeus with quick follow-ups and organized handling of customer support. Ongoing cases are reviewed daily and for longer-term solutions, weekly reviews are held throughout the organization. Support efforts typically involve Engineering, Sales, Admin, and any applicable distribution partners. Radeus strives to ensure our customers and products are fully supported in the field!

Conclusions
The 8200L was designed specifically to replace the Vertex Communications 7200 ACU in the field by matching the existing interface to the 7150 ADU. The 8200L is the logical choice if you are looking to minimize the cost and labor associated with updating end of life 7200 ACUs. In addition to providing an easy upgrade path to a modern and supported ACU architecture, the technology updates and additional features of the 8200L make it simple to understand and operate when it comes to day to day operations. You get all of the upsides you would expect from a modern ACU, without the traditional switching costs associated with major platform changes