LORAL Data Systems

A Publication of EMR Telemetry

April 1992

the leading EDGE

Vol. 1, No. 1

A message from the vice president...

I am happy to report that it has finally happened! For more than two years you have asked for a newsletter that will keep you informed of our activities here in Sarasota. The resources are now in place to accomplish this. You are looking at the first of what is planned to be a monthly sales newsletter.

Jim Horvath has been appointed to the position of *Marketing Communications and Advertising Manager.* In his new role, one of Jim's duties will be to act as managing editor for this newsletter. Jim reports to **Bill MacNeill** and his primary duty is to coordinate and direct the efforts of Bill's Technical Communications staff to accomplish marketing support functions. This includes all marketing support projects such as advertising, sales, videos, sales literature, trade shows, and the annual sales meeting.

Please support Jim's efforts by providing feedback on how this publication can be improved to meet your needs. Jim, Bill and I are keenly interested in addressing your needs through this new tool. Currently, it is *not* intended to be passed on to customers directly as it may contain sensitive material. We will be evaluating this newsletter to see if it can be edited and published for distribution to customers.

As we approach the close of Loral Fiscal Year 92 (LFY92), I am pleased to report that it appears we will meet most of our financial goals. Total telemetry orders for products, systems and service is approaching $40 million for the second year in a row, and revenue and profit goals appear to be achievable. Looking ahead to LFY93, however, there is both good and bad news.

First the bad news. As everyone is aware, amazing political changes have occurred in the past year that have shaken the plans, budgets and economies of every country in the world. These changes have led to elimination or delay in many of the programs which drive the marketplace for telemetry. This in turn has increased the competitive pressure within a shrinking market.

Now for the good news. The LDS/EMR Telemetry Group is financially strong with a healthy backlog. After two years of heavy investment, we are poised with an O/S90 system product which is at the leading edge of Open Architecture systems technology. We will be offering O/S90 systems at aggressive prices to take advantage of customers with low initial budgets who have plans for future growth. We have introduced the PCX as a low-end product and will be evaluating whether or not additional investment in this area appears worthwhile. Internally, we have begun a marketing strategy which focuses our attention and resources on specific market segments. This has already begun to pay off in terms of identifying additional development effort necessary to better address the segments. Finally, **Carl Aquilino,** our *Telemetry Group Senior Vice President,* is firmly committed to aggressively competing in today's marketplace.

I am convinced that the opportunity exists to make LFY93 a growth year despite the difficulties we see. I look forward to seeing all of you at the International Sales Meeting in Orlando in April to discuss how we can successfully meet the challenges of the coming year. ■

A message from Bud...

Seeing is believing, and we now have our first newsletter — thanks to Gary who listened to your requests at our sales meetings and was determined to accomplish this task. He assigned and challenged **Jim Horvath** to make it happen... and here it is! A lot of people are involved in providing inputs to Jim and it is not easy to get people to respond. But Jim did it!

I am hoping that we can continue to support him so our newsletter can become a communication tool that helps you in the field. Please feel free to provide any recommendations or even input that you would like to see included. It's your newsletter and it is being published for you. Certain information may be sensitive and should not be read by our customers or competition, so I told Jim to label these areas. Read, enjoy and destroy!

My thanks to Gary, Jim and the many people involved that made it happen. I know our sales field people will enjoy this newsletter.

the leading EDGE

The Leading Edge is a publication of Loral Data Systems, EMR Telemetry.

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New Sales & Business Opportunities...

Terry Miller was the first salesman to sell our PCX System—*congratulations!* The order was booked in December from Loral Aeronutronics, Newport Beach, for a complete PCX System. Rumor has it that **Paul Mears** may be next... but when Joel finds out, *watch out!*

SALES TIPS

How do people become superstars in sales?

- They have learned to learn. They keep an open mind, always fresh for new ideas and concepts.
- They make things happen by their own efforts.
- They all have two or three new battle plans ready at a moment's notice. They plan for anything possible that can go wrong.
- They are innovators. They create more than compete.
- They have a high sensitivity to their customers' needs.
- Sales pros know all of their major strengths and weaknesses. They are first to admit they make mistakes and learn from both positive and negative experiences.

— Bruce Fletcher
President
Aiming High Group

Today selling is:

- Not outselling the competition — it's outthinking them.
- Not treating all customers alike. It's setting the way customers want to buy.
- Not simply calling at high levels. It is calling on people with influence.
- Not relying on product features to differentiate your product offering. It is creating benefits based on the way the customer uses your products.
- Not just understanding your customers' needs. It's understanding that is critical to their business and how to help them attain advantage.

— Advertisement for Wilson Learning Corp.

application notes
A PUBLICATION OF EMR TELEMETRY

OPEN ARCHITECTURE SYSTEM FOR REAL TIME TELEMETRY DATA PROCESSING

Bob Feather
Software Products Manager

Michael O'Brien
Application Engineer

ABSTRACT

There have been many recent technological advances in small computers, graphics stations, and system networks. This has made it possible to build highly advanced distributed processing systems for telemetry data acquisition and processing. Presently there is a plethora of vendors marketing powerful new network workstation hardware and software products. Computer vendors are rapidly developing new products as new technology continues to emerge. It is becoming difficult to procure and install a new computer system before it has been made obsolete by a competitor or even the same vendor. If one purchases the best hardware and software products individually, the system can end up being composed of incompatible components from different vendors that do not operate as one integrated homogeneous system. If one uses only hardware and software from one vendor in order to simplify system integration, the system will be limited to only those products that the vendor chooses to develop.

To truly take advantage of the rapidly advancing computer technology, today's telemetry systems should be designed for an open systems environment. This paper defines an optimum open architecture system designed around industry wide standards for both hardware and software. This will allow for different vendor's computers to operate in the same distributed networked system, and will allow software to be portable to the various computers and workstations in the system while maintaining the same user interface. The open architecture system allows for new products to be added as they become available to increase system performance and capability in a truly heterogeneous system environment.

SYSTEM DESCRIPTION

The optimum Open Architecture System for telemetry (see NO TAG) supports workstations and servers from different vendors in an integrated homogeneous system environment. System software can execute on any workstation or server in the system with the same look and feel. Different software packages execute on different workstations while maintaining a consistent man–machine interface.

Data acquisition is performed by the Telemetry Front End equipment which synchronizes, decommutates, and processes raw telemetry data for storage to disk or digital tape. In an open system the data is stored in either the Telemetry Front End or on a server. The stored data is available to all workstations regardless of the file and number storage format.

Realtime display can be performed from any workstation utilizing the same display software. The displays have the same look and user interface regardless of the workstation vendor.

Playback and analysis display software accesses the stored data files as if the data was stored on the local workstation. For example, a particular system stores data on a DEC server in DEC file and number format. A Sun workstation on the system can access the stored data files as if they were stored in Sun file and number format. The system automatically translates the files and data between workstations whenever a data file is accessed.

Each workstation in the system is capable of performing setup and control. While the system maintains a central setup database for control and configuration management, a user can control system operation from any node in the network.

The Open Architecture System can accommodate new hardware and software products as they become available. This capability eliminates the need to redesign the entire system or rewrite all of the existing software each time the system is to be modified.

To achieve a truly open system, all of the system hardware and software is designed around industry standards. While the hardware and software packages may be different, the interfaces between them are consistent with widely accepted industry standards. In the optimum Open Architecture System there are four critical areas of system compatibility:

- Operating Systems
- Network Communications
- Network Database Setup
- Distributed Network Graphics

OPERATING SYSTEMS

In the optimum Open Architecture System, software is source code compatible across vendor hardware platforms. Therefore, the operating systems on workstations must be compatible. The only operating system on the market which is supported by most major vendors is UNIX. However, each vendor has its own variation. In order to achieve some compatibility between systems, two major consortiums of companies have been formed to establish UNIX standards (see NO TAG). UNIX International is recommending AT&T's System V Release 4 as the standard for UNIX operating systems. The Open Software Foundation has been working on OSF–1 as a standard for UNIX. What both consortiums agree on is that a common operating system should conform to IEEE's Portable Operating System for Information Exchange (POSIX) standard. This includes IEEE 1003.1 System Services, 1003.2 Shell Scripts, and 1003.4 Realtime Draft.

Therefore, the Open Architecture System is designed to conform to the POSIX standard. DEC has even announced that VMS is going to be POSIX compliant, making it possible to have workstations running VMS and UNIX in the same system. It is not always possible to write software without using some vendor specific extensions of UNIX. When this needs to be done, then the code is clearly identified and isolated so that it can be easily modified to run on other vendor's systems.

The operating system must support popular ANSI programming languages such as C and FORTRAN. In addition the system provides ADA support, since this is becoming a government requirement for new programs. The system software also supports bindings to ADA software since government software may require interfacing with Open Architecture System software packages.

NETWORK COMMUNICATIONS

All of the workstations, the server, and the Telemetry Front End equipment communicate over a common network in the Open Architecture System (See NO TAG). Currently the only network which is supported by all major vendors is Ethernet IEEE 802.2. In the future the system will use the new fiber optic FDDI network. Whereas Ethernet operates at 10 Mbits/second, the new fiber optic network will operate at 100 Mbits/second.

The Open System packet protocol is the Transmission Control Protocol / Internet Protocol (TCP/IP). TCP/IP is supported by all major workstation vendors and network software systems. TCP/IP supports all system network functions except for data broadcast. In this case the system uses the User Datagram Protocol (UDP). In the future, the Open Architecture System will use the Government Open System Interconnect Protocol (GOSIP) when it becomes more commonly supported.

In order to translate file and number formats between different vendor's workstations and servers, the Open Architecture System uses the Network File System (NFS). NFS allows all files in the system to be available to any workstation regardless of where the file is actually stored. In addition to translating the file formats from one workstation to another, the Open Architecture System supports system application code for further translation. This is where the system performs number format translation on the actual data stored in a file.

NETWORK DATABASE

In the optimum Open Architecture System all setup, processing, and display information is stored in a commercially available relational database (NO TAG). The system supports databases from multiple vendors such as Ingres, Oracle, and DEC's Rdb. This allows the system to use a database which is in common with existing systems. The system user can also use the same database to support mission specific processing routines.

For portability, all software which accesses the database uses ANSI Standard Query Language (SQL) for reading and writing database information. The database records are never accessed directly. This allows the database to be changed without rewriting all of the software, since the SQL calls remain the same. Most commercial databases support SQL as well as providing powerful SQL extension instructions. The Open Architecture System minimizes the use of extensions. Whenever a non–SQL instruction is used by a software routine accessing the database, the instruction is clearly identified and isolated. When the database is changed, the instruction is replaced by an equivalent instruction in the new database.

In an open system, a user can access the database for any workstation in the system. To support this the Open Architecture System provides network communications interfaces for accessing the database over the system network. This allows software such as display packages to access information from the database using embedded SQL calls in the code. The software may execute on any workstation but will still access the correct database stored on the server.

If the Open Architecture can not use the same database as the existing telemetry system, then the information will have to be copied. Most commercial databases offer gateway routines for copying data between different vendors databases. If a gateway is not available, the user can easily write a copy routine using SQL instructions for accessing the Open Architecture System's database.

In order to provide a consistent man–machine interface for setup across all workstations, the database setup menus are implemented separately from the database. The setup menus provide a standard windows based user interface. While the database itself may be changed, the user setup menus will remain the same.

NETWORK GRAPHICS

Users will interface with the optimum Open Architecture System through its OSF/Motif graphical user interface based on Version 11 of the X Window System (see NO TAG). Its familiar Microsoft Windows / Macintosh style appearance and behavior make it easy to learn and use with the advanced telemetry applications. Using a mouse or keystrokes, the user points and clicks on icons, pull–down menus, and control buttons to operate the entire system and its applications.

The Graphical User Interface (GUI) allows the telemetry user to view and run multiple applications in separate windows at the same time. Because of the networked client–server capabilities of the X Window System, programs can run locally or on remote servers with complete transparency to the program.

The Open Architecture System's Graphical User Interface consists of the Motif window manager, X Window System, menu manager, and numerous graphical applications. The graphical applications support functions such as telemetry front end setup, data acquisition, realtime display, playback display, and system administrative functions.

A complete set of user tools are provided with optimum Open Architecture System which supply industry standard services for supporting future needs without requiring the architecture of the system to be modified.

Application Programming Interfaces (API) are provided for:

- Networking
- X Window utility features
- Display hardcopy
- Data file manipulation and analysis
- Database access utilities for stream and parameter information
- Realtime calculations
- Data display primitives

SUMMARY

The optimum Open Architecture System as defined here, is truly a homogeneous system based on widely supported industry standards. The system software can execute on a variety of workstations and servers which support the POSIX operating system standard. Workstations from different vendors communicate across a commonly supported network based on Ethernet, TCP/IP, and the Network File System. The system can be setup and controlled from any workstation using a commercial SQL relational database. Network graphics support is provided by the X–11 Graphical User Interface. The Open Architecture System provides a common user interface for setup and display based on the Motif user interface style guide. The system is designed around industry accepted standards instead of specific vendor products. This allows the Open Architecture System to take advantage of the best hardware and software products available today and in the future.

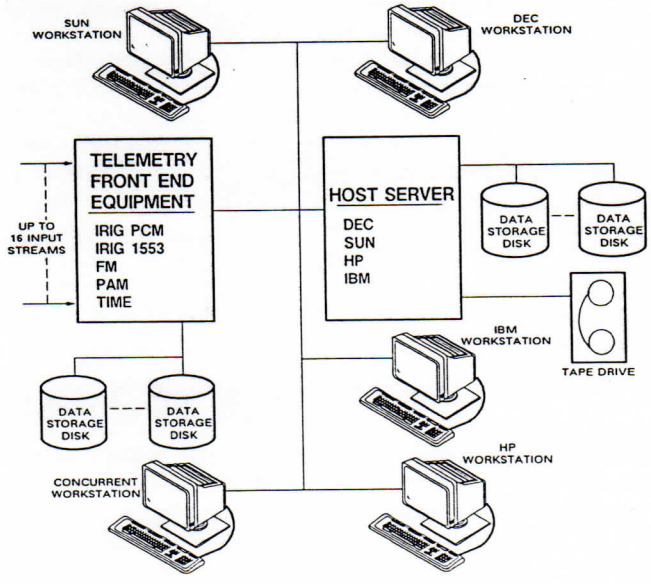

Figure 1–1. Open Architecture System

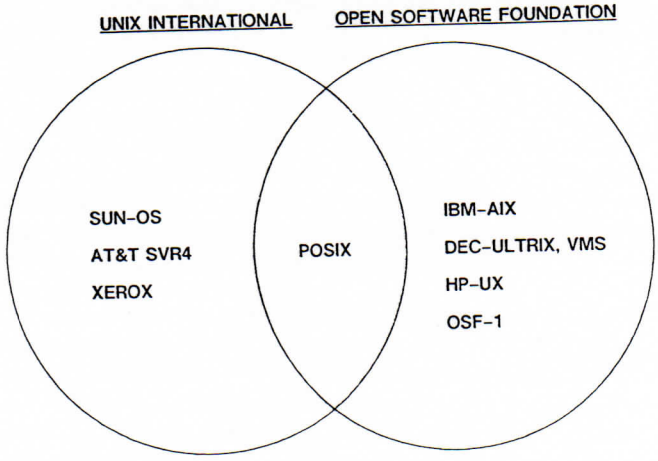

Figure 1–2. Operating Systems

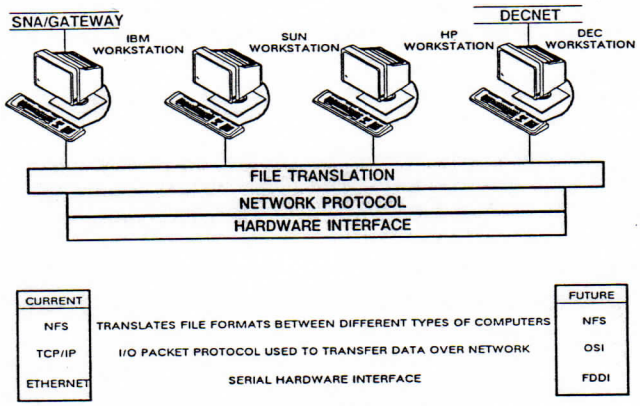

Figure 1-3. Network Communications

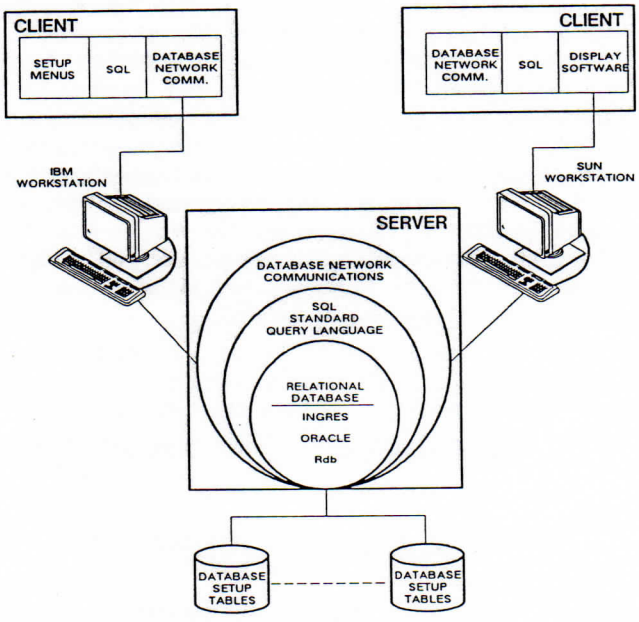

Figure 1-4. Network Database

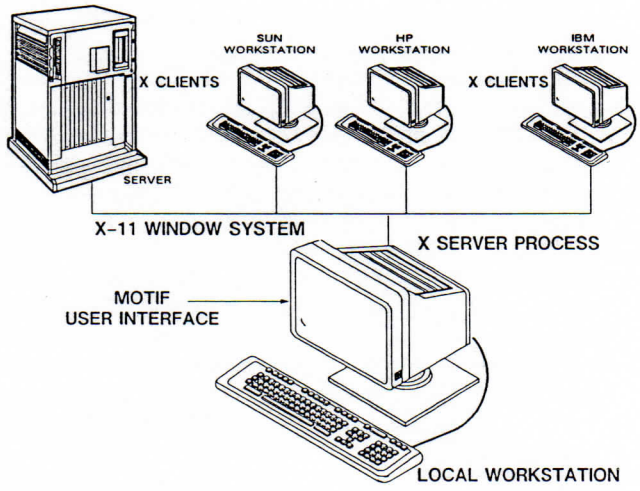

Figure 1-5. Network Graphics

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APRIL 1992 LORAL Show Schedule & Special Events

SUN	MON	TUES	WED	THURS	FRI	SAT
EMR TELEMETRY SALES MEETING DOMESTIC AND INTERNATIONAL RADISSON MAIN GATE ORLANDO, FL			1	2	3	4
5	6	7	8 ARMY AVIATION QUAD (AAAA) ATLANTA, GA	9 DIVISIONS: LIRIS LDS LAERO	10	11
12	13	14 NAVY LEAGUE WASHINGTON, D.C. BOOTH 1802 LIBRASCOPE BOOTH 3208	15 DIVISIONS: LDS-AK LS&R LIRIS LCR HYCOR LFS LES LDS LDS-AZ LWDL LIDS LAERO	16	17	18
19	20	21	22	23	24	25
26 AOC LAS VEGAS	27 DIVISIONS: LIRIS LDS LS&RS	28	29	30		
FIESTA CROWS (AOC) LAS VEGAS, NV LDS-TELEMETRY LDS-DATA RECORDER	LIRIS LS & RS	ITEC LUXEMBURG GERMANY LEDS LT & TS LDS-AK LS	SPACE CONGRESS LS & RS LDS TELEMETRY LSIS			

LORAL
Data Systems

MAY 1992

LORAL Show Schedule & Special Events

SUN	MON	TUES	WED	THURS	FRI	SAT
					1	2
3	4	5	6	7	8	9
10	11	12 ETC GARMISCH- PARTENKIRCHEN GERMANY TELEMETRY LI CONIC	13	14	15	16
17	18	19 NAECON DAYTON, OH DIVISIONS: LI LDS-AR	20	21	22	23
24	25	26	27	28	29	30
30						

Product Line Input...

PCX

Work continues on improving the performance of the PC-based EXPRT — the PCX. We are adding dual 4KW buffers so that the contiguous input of data to the PC does not slow the displays to a crawl. This is necessary since, despite the name of the PCX's input card being called the DMA, a PC cannot really do DMA in the true "main-frame" sense of the word. We expect to begin shipment in the March to June timeframe.

MS-DOS Software

EMR continues its commitment to MS-DOS with the recent shipment of MS-DOS based 5000 and 5500 setup software.

New Time Code Units

The 741 is, as most of you know, discontinued. We have developed an RFQ and sent it to the four time code manufacturers — *Trak, Datum, Kode* and *TrueTime.*

MANUFACTURING NEWS

Manufacturing is going to be handling the new time code units. In the past, Systems/Engineering handling them. In order to reduce cost and overhead, Manufacturing will start handling the orders for time code equipment just like an order for anything Manufacturing produces.

R&D PROGRESS

Robert Williams has been assigned the task of upgrading the 8715 configuration to the Open System configuration (tentatively being called the-004).

Alex Hamilton is working with Ciprico to increase the speed of our DOM. The current DOM runs at 1MB, but with the Ciprico in the following configuration, a 2MB rate is advertised.

With other similar configurations (Using RAIDS), 3M and 8MB rates are advertised. Alec continues working with the vendor. I would hope that we could at least bring in the first level of software and hardware just to quality the rates for future system opportunities. The DOM is not too slow when compared against the real rates of the competition, and with the Ciprico "pump-up," we could blow the lid off the competition — just hope the price isn't as lofty.

SALES TIPS

PCX

During this year's ITC, we had the chance to talk with several potential customers on the features of the PCX. The following reflects what seemed to pique their interests.

It's A Tool!

We noted to our customers that the PCX was designed as a tool, not as a system. And as a tool the inclusion of sources and the general 40-bit BCD time input all seemed to drive the point home.

We told them that it was impossible for anyone to design a system that would meet all of their exact needs in a cost effective manner, since their needs were all unique, but essential in their particular day-to-day operations — all agreed. We further stated that if you try, the man-machine-interface is impossible to use. In this light, EMR felt it only reasonable to give the customer the sources to a product that had all of the features they would expect to find in a PC but with the flexibility of controlling their unique day-to-day needs.

We also used the lack of software for time code and external bit sync as a selling point of the "tool" approach and few objected. They all understood that a "tool" should allow the inclusion of existing hardware (time code and bit syncs) without trying to force the sale of EMR's own products. Also, they told us that, "Heck, with the sources, I can write my own RS-232 driver for these boxes and interface it with the program — no problem! It's in 'C' isn't it?" Of course!

Field Repairable

The TFE is the EXPRT series. It's not the most advanced, but it is the most stable — having been in production for several years. It is bug-free and time tested. Most PC products do not have established hardware for the TFE, with all promising hardware "soon" — EXPRT exists... its not vaporware.

Also, with all other PC telemetry products on the market, they have the size limits of the PC. Since the cards are so small, the functionality needed for a PC telemetry system mandates the use of SMT (Surface Mount Technology). SMT is great for compressing functions onto chips, but if something goes wrong the unit must go back to the vendor for repair — the needed tools are not in the field for repair. The EXPRT is mostly DIP technology, and with its size to chip count ratio, it is the only PC product that is Field Repairable.

I/O

Using the PC as the TFE chassis restricts I/O. For example, most PC systems are limited to 16-channels of DAC output. While the PCX is 64, a few (if any) have the PCX's 128-discrete bit output. Also, the PCX has one unused parallel input/output slot that can be used with other equipment.

Expansion

The PC as a TFE chassis has an inherent problem with room to grow as you add functions into the PC (more disk, more display, more memory, etc.). PCX minimizes any restriction by using the separate EXPRT chassis.

The EXPRT chassis expands the I/O to another chassis without filling up all of the PC's I/O. If we filled up the PC's I/O (like other vendors) then things like IRMA, Ethernet, extra parallel and serial outputs, could not be supported.

High Powered PC

The PC that is provided with PCX is a 386 machine with enough memory and hardware (mouse, VGA, etc.) that any application from spreadsheets and desktop publishing to Windows 3.0 will run on it.

Continued Growth

EMR sees continued growth for the PCX. For one, having the sources in the hands of the customers insures that

Continued on page 4

Recent system deliveries...

DAES

The Data Acquisition and Encoding System (DAES) was purchased by Martin-Marietta in support of Titan IV launches.

The DAES system accepts discrete data from the EMR Data Communication Equipment (DCE II) command output system, and accepts analog and discrete launch vehicle status and transmits the data back to the EMR DCE I command system for command and status display and verification.

STC-System 90 RTADS Upgrade

Boeing recently upgraded the Real-Time Telemetry Analysis and Display System (RTADS) to a System 90. The RTADS is installed at the Satellite Test Center (STC) in Sunnyvale, California.

The RTADS system monitors the Inertial Upper State (IUS) upper stage rocket assembly from launch to satellite release. The IUS is used to launch satellites into orbit for a variety of applications such as the Megellan and Ulysis programs, as well as geostationary orbit for communications applications. The entire mission is monitored by the RTADS system and all system decisions regarding IUS performance are made from this monitoring.

The upgrade to the RTADS system was to improve system performance due to additional tasks which have been added. Smaller high-performance host computers replaced the large mainframes, and the 8715 pre-processor replaced the original 715 pre-processor.

Ft. Rucker

The U.S. Army Aviation Technical Test Center at Ft. Rucker, Alabama is presently upgrading their EMR 700 series based Mobile Telemetry Van System. The upgraded system will include an EMR 8715, MicroVAX 4000, and DEC 3100 workstations. The system will be used for army helicopter testing at Ft. Rucker and White Sand Missile Range. A second system will be procured to replace their laboratory VEDA telemetry system after the van system is completed.

U.S. Army, Edwards Air Force Base

The U.S. Army Aviation Flight Test facility at Edwards Air Force Base, California is presently upgrading their EMR 700 series based Real-Time Data Acquisition and Processing Streams (RDAPS). The RDAPS system was the first EMR 715 based system built by EMR. The upgraded system will include an EMR 8715, MicroVAX 4000, and DEC 3100 workstations. The system will be used for army helicopter testing at Edwards AFB, California. A total of three systems are being procured.

Aeronautical Research Laboratory (ARL), Taichung, Taiwan

A Date Acquisition and Processing System (DAPS) has been built by LDS for the Aeronautical Research Laboratory (ARL) located in Taichung, Taiwan. This system will process the test data generated during the flight testing of Taiwan's IDF fighter aircraft. The DAPS provide a dual EMR System 90 for telemetry data processing using dual EMR 8715 Multiplex processors and other EMR 8000 Series products front-ended to dual host computers sharing a large disk farm for data storage. The DAPS processes in real-time, two serial PCM streams, two FM multiplexes and two serial-time streams. It can, with real time processing, simultaneously process an analog tape in playback mode that inputs a serial PCM stream, one FM multiplex, one serial time stream and two dual redundant MIL-STD-1553 bus streams. The first half of the DAPS, the Playback Subsystem, was delivered in December, 1991. The second half, the Real-Time Subsystem, will be delivered in the spring of 1992.

Duetche Airbus Transal

The Duetsche Airbus Transal airborne telemetry system collects data from standard PCM, MIL 1553 and ARINC data sources and records this data to an AMPEX DRCSi Digital Tape Recorder while supporting concurrent real-time data processing and display functions. The system includes data acquisition equipment, digital-to-analog capability, data simulation and a wide range of data pre-processing capability. Emphasis is given to the implementation of the AMPEX recorder interface.

The entire system is composed of data acquisition equipment to directly input measurements, a telemetry front end to collect PCM, MIL 1553 and ARINC 429 and 561 data, a host computer to control and monitor the setup, recording and distribution of data, and a pair of high resolution color workstations for operator control and data display. The equipment is housed within a single, military-type electronic enclosure which is loaded into the cargo bay of the aircraft as a single unit and manned by two people during flight.

The Digital Tape Recorder provides or a large data capacity and very high data rates. Special I/O requirements, data rates and data selection options are discussed. Consideration is given for the best flight utilization of the AMPEX recorder in both acquisition and playback modes. ■

Product Line Input...

growth will occur by the user community,. Furthermore, we continue to add functionality to the PCX. Just since the ITC we have added TFE status, a dynamic disk capacity readout, improved the parameter and setup selectability, installed 1711 and 1720 drivers, made the F3 alarm page now work on the graphics page, installed a logical AND/OR operator for the F3 alarm page... these all bespeak the continued investment that EMR sees in the PCX. We are continuing to look at a Macro capability and the capability to translate PCX data into a generic delimited ASCII file so that it could be read and displayed by any of the commercial software out on the market — both very, very powerful capabilities.

Conclusions

One potential customer who had little interest in PCX upon first glance became very interested after hearing these concepts put into words. He said that the demo disk was very good, but these concepts were missed — and they probably were missed as they are hard to put into a high-level introduction. Therefore, it will fall to all of us to pass them on whenever working an opportunity. ■