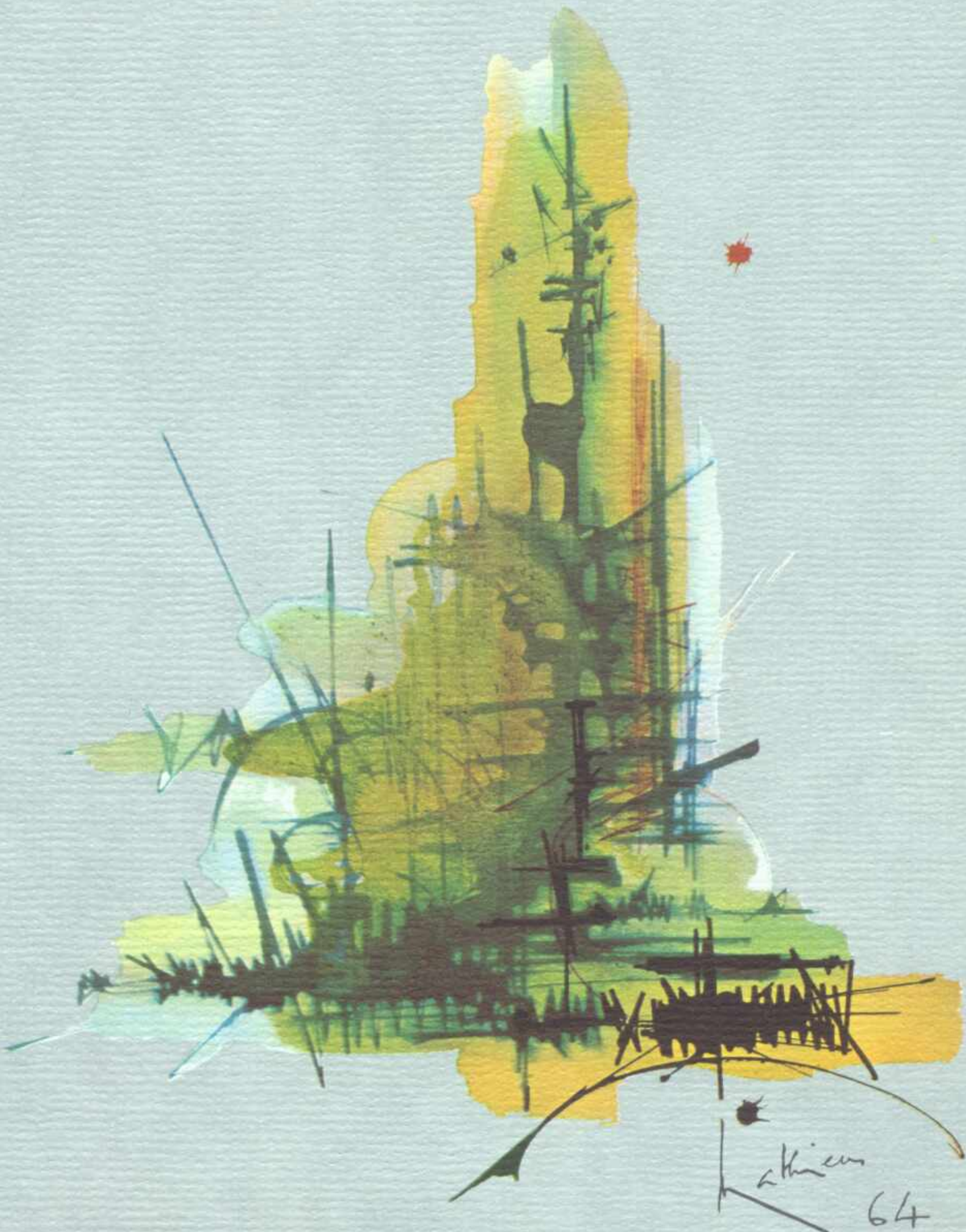
3C PULSE



Destination Mars **DDP-124** **Microcircuit Memory — ICM-40** **Power Unit Model 2050**

DESTINATION MARS

Late in 1962, Mariner II, man's first emissary to other worlds, scouted the planet Venus, 36 million miles from Earth. By the summer of 1964 and early spring 1965, the Moon's surface was being examined at close range by Ranger spacecraft, and, nearer home, manned vehicles were making orbital flights.

Then, on July 14, 1965, far beyond the Moon, past Earth — orbiting spacecraft, Mariner IV successfully rendezvoused with the planet Mars; contact was made after a flight of 228 days and 325 million miles when television cameras locked on the Red Planet and gave man what is to date his closest view of the legendary planet.

Project Began in 1962

When the Mariner Mars 1964 Project was authorized by the National Aeronautics and Space Administration in late 1962, it was recognized as an assignment somewhere between difficult and impossible. However, such tasks are characteristic of most aspects of space exploration in its present dawn age. The distances, forces, and hazards of interplanetary space are huge; though our knowledge and technical skills are growing rapidly, the unknown aspects remain extensive.

Mariner's Venus 1962 mission, then just successfully concluding, gave encouragement and contributed vital knowledge and experience to the Mars mission, but the scale of the problem was larger in all aspects. It was to the successful Mariner Venus team that the new problem was presented.

Not the First

The Mariner Mars system would be the first of its kind, but not the first of its family. The dynasty was founded in late 1958 and 1959, when NASA and JPL worked out a linked series of unmanned lunar and planetary missions which would advance the technology of space exploration while accumulating basic and practical knowledge about the Moon, the planets, and the solar system.

A three-stage launch vehicle system would have been needed, but the development of restartable second-stage rockets (which in effect made two stages out of one) made this unnecessary. Atlas/Agena was to be the launch vehicle for Ranger, the first lunar member of the series; early Mariner planetary and the Surveyor lunar spacecraft developments were first associated with Atlas/Centaur, a higher-performance system then being designed. Subsequent schedule changes, together with advancements in Agena and spacecraft technology, necessitated and made possible the quick development of an Atlas/Agena-boosted, lightweight planetary spacecraft and its successful use in the Mariner II mission to Venus.

Now the same switch was suggested for the Mars mission: marry the best elements of the Ranger-Mariner II-Atlas/Agena system with the Mars-spacecraft development and launch a Mars mission in 1964. There were less than two years to do the job and a rigid deadline was imposed by the Mars launch opportunity. The Venus mission had been developed in less than a year. It could be done — just barely.

(*SPECIAL REPORT ON MARINER IV CONTINUED ON PAGE 2.*)

3C PULSE

Volume III, Number 2

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CREDITS: Jet Propulsion Laboratory for technical information on Mariner IV. Jonathan Tam Gallery for cover painting.

3C SYSTEM CONTROLLED TEST DATA ON MARINER IV FLIGHT TO MARS

On board the NASA/JPL Mariner IV spacecraft which flew by Mars July 14, is a miniature electronic system which processed all scientific data from interplanetary-flight experiments for transmission to Earth and prepared television pictures of the planet for recording on magnetic tape.

The system is called a Space Data Automation System (SDAS), according to Robert C. Baron, Computer Control Company, Inc., program manager, who directed its development and that of a similar system used during the 1962 Mariner II Venus flight.

Since Mariner IV was launched from Cape Kennedy, November 28, 1964, the SDAS gathered scientific data from in-flight experiments and sent calibration signals to the instruments which measured magnetic fields, cosmic radiation, solar plasma, and various particle intensities of outer space.

As Mariner IV reached the point of closest approach to the Red Planet, approximately 5400 miles, the SDAS processed 21 television pictures of the Martian surface, and measurements of its atmospheric properties for transmission to Earth. Encounter with Mars occurred on the back-side of the planet as seen from Earth, between the Equator and the South Pole. The 575 pound spacecraft passed by on the right side of Mars at about a four o'clock position before heading around the planet.

During the 109-day flight to Venus, Baron pointed out, the previous 3C system handled over five million bits of scientific data. From the Mars flight, which took 228 days to cover the 325 million mile path through space, the SDAS processed two and a half times that amount of information.

For this flight, an advanced packaging technique was developed by Computer Control Company. This technique made it possible for the electronic system to contain in the same volume 7500 microminiaturized transistors, resistors, diodes, capacitors, and other components. This is almost three times the number of components used in the Mariner II system, permitting greater ability to handle scientific data.

While very complex, this electronic system is only the size of five paperback books, weighs less than 7½ pounds and occupies less than one-tenth of a cubic foot within the vehicle.

The SDAS is one of a series of systems developed by Computer Control Company for Jet Propulsion Laboratory, prime NASA contractor for unmanned exploration of the moon and planets.

JET PROPULSION LABORATORY *California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103*

30 August 1965

Mr. Benjamin Kessel, President
Computer Control Company, Incorporated
Old Connecticut Path
Framingham, Massachusetts 01702

Dear Mr. Kessel:

This letter is to express my appreciation to you for the important contributions of the Computer Control Company to the Mariner IV Project. Your excellent performance was an essential element in the success of Mariner IV.

The Science Data Automation System supplied by your company was the major link in sampling and processing the data collected by the scientific instruments. In particular, its function as the controlling and processing element for the picture taking sequence was performed to perfection and served as the keystone to the successful Mars encounter.

To produce the DAS subject to the constraints imposed by deep space flight was an extremely challenging task. You are to be congratulated for your part in the solution to the difficult technical and management problems encountered. It must have been a source of understandable pride to you to learn that this complex equipment operated for more than 6000 hours in space without a single malfunction.

I extend my personal thanks to you and your staff. As a token of our appreciation and a momento of the occasion, I have enclosed several of the historic photographs of Mars taken during encounter.

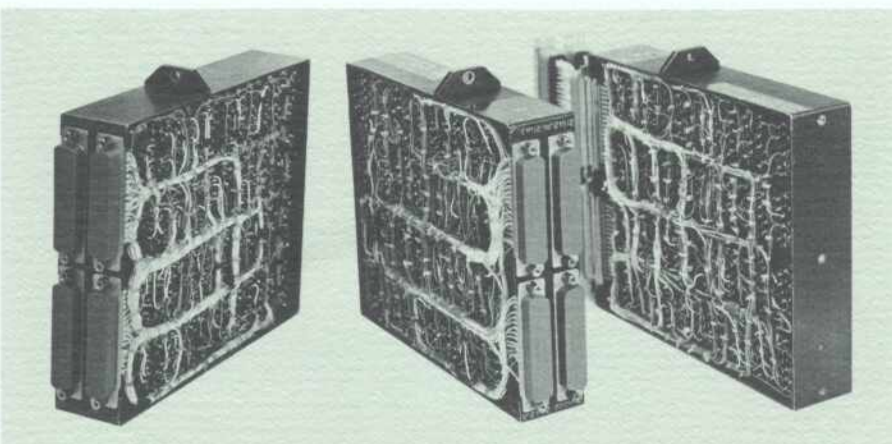
With personal regards.

Sincerely yours,

Robert V. Meghreblian, Manager
Space Sciences Division

RVM:rc
Enclosures

Telephone 354-4321 *Twx 213-449-2451*



Space Data Automation System

(From inside front cover)

More Complex Mission

The energy required to ship a pound of payload to Mars in 1964/65 is actually a little less than that which was needed to send it to Venus in 1962. The slightly lower energy requirement, however, turned out to be just about the only aspect of Mariner Mars that wasn't twice or three times as difficult as the earlier mission.

Mariner II had to operate for about 2500 hours on its flight to Venus; Mariner IV had to be designed for 6000 to 7000 hours of flight life, on the way to Mars, at the planet, and beyond.

Then there was electrical power. Mariner Mars would need only a little — less than 200 watts — but it must come from sunlight, whose power decreases as you go away from the Sun. Mariner II had one solar panel partly disabled enroute to Venus but drew nearly as much power from the undamaged one at Venus as it had received from both panels near Earth. Going out from Earth to Mars, the solar power decreases instead of increasing. Mariner Mars must have more than twice the solar-panel area of its predecessor — 70 square feet as against 27.

Environmental Differences

Considering the enviroment through which the spacecraft must travel, we again see a sharp difference from any mission attempted before. Mariner II flew toward the Sun, braving increasing solar radiation, which helped with the power problem but aggravated the temperature-control problem. Mariner II had become hotter and hotter on the way to Venus; Mariner Mars would become colder on its journey.

Space Dust Hazards

Beyond Mars, where one might expect to find another planet, is the asteroid belt, consisting of thousands of planetoids in independent solar orbits. Accordingly, astronomers believed that the meteoritic intensity might be expected to increase in the direction of this belt. In addition, the Mars path lay across several "cometary" meteor streams. Mariner might be expected, then, to run into more space dust than had previously been experienced. Mariner II's detector had recorded only two impacts in its flight, while Mariner IV indicated well over 100 in the first five months of its journey. Since the total area of the spacecraft is about 200 times that of the small dust detectors, the detectors record only a fraction of the particles actually hitting the vehicle.

Communications Challenge

In addition to the increased flight time and the change of direction, another inevitable dimension put a strain on the Mariner Mars mission: sheer distance. At Mariner II's maximum 54 million miles, radio waves took nearly five minutes to come back to Earth; communication with the Mars spacecraft would be delayed about three times as long. More important, the communications system would have to be better . . . nine times better, since radio strength decreases as the square of increasing distance. Both the ground and flight units would have to be improved.

Though space exploration serves experimental science, it is not itself purely experimental; this is evidenced by the distaste with which spacecraft developers brush off such labels as "cut and try," "file and fit," "shoot and hope." With the exception of extremely long missions such as Mariner IV, most space projects live nine lives on the test bench before they are allowed one life in flight: the emphasis is on performance as predicted from test experience.

Mariner Mars' development schedule allowed less than 1000 hours for testing each flight article for a 6000-hour mission — a tight schedule for a large and exacting job.

Flight Simulation

A Mariner Mars temperature-control model — a full-scale spacecraft duplicating the heat-generating and heat-transferring properties designed into the flight articles — was built and tested as long as possible in JPL's 25-foot space simulator, which was equipped to approximate the black, cold vacuum of space and the blazing radiance of the Sun. Correction factors learned from the flight of Mariner Venus had been engineered into this test device to achieve the best possible Earth-surface reproduction of space conditions.

Before the flight spacecraft were built, a prototype or proof-test model was put together. Serving as a final test bed in subsystem development, as well as the initial system-test vehicle, this spacecraft was at one end of the development loop: modifications found necessary in proof testing were themselves retested on the same craft. At the end of the design evolution and after 1100 hours of system test, the proof-test model has evolved into a functional duplicate of the flight spacecraft; they, in turn, were spared the rigors of prolonged design evaluation by the existence of the test spacecraft which could never fly a mission. The proof-test spacecraft was also used for inter-system testing, verifying compatibility of the spacecraft with ground equipment. It then supported both flight missions by simulating observed flight situations so that they could be studied at close range.

Journey Begins

Three Mariner Mars spacecraft began the journey to the planet Mars from a canyon north of Pasadena, California, at the Jet Propulsion Laboratory, where they had been designed, assembled, and tested for months. Two of the three would fly; the third was a spare. They were partly disassembled, carefully packed, and loaded on moving vans. On September 11, 1964, after a four-day journey, the last van reached the Air Force Eastern Test Range, Cape Kennedy, Florida.

Here each spacecraft was carefully inspected and retested. There were spare parts for the individual plug-in units of the Mariner spacecraft. The calendar and the high quality standards would allow no tinkering or repair in the conventional sense: replacement of modules, if necessary, should solve faulty-parts problems.

At the Cape, two 100-foot-high Atlas/Agena D rockets were waiting, each standing in its own launch complex. The engineers could select either one for the first launch, and could launch the two missions as close as two days apart if desired.

Dress Rehearsal

Spacecraft and launch vehicles were given separate system tests, assuring that each would function in every phase of its role in the mission. The mechanical, electrical, and radio compatibility of spacecraft, vehicle, ground equipment, and tracking system were tested. Finally, at the beginning of November, the Mariner III spacecraft and launch vehicle stood on the pad, going through a dress rehearsal. The actual Mars launch period opened on November 4 and lasted for only about a month.

Mariner III Launch

Mariner III was launched toward Mars about midday on November 5. Minor launch vehicle difficulties encountered on the first day's countdown had been solved to the engineers' satisfaction; the pre-launch countdown was normal; the weather was good. The tall, snub-nosed space vehicle rose from Launch Complex 13 with an air of confidence.

Nevertheless, within minutes the mission was doomed, though it took nearly nine hours for it to die. The cylindrical fiberglass-honeycomb nose fairing, or shield, designed to protect the spacecraft during the smashing thrust up through the atmosphere and then to be jettisoned, failed during the climb through the air. When the time came, it could not be ejected.

Early indications of trouble came at the end of the powered flight. Because of the drag of the nose fairing, the velocity was too low. The spacecraft would not reach its target.

Eight Hours Later

About 5½ minutes later, after spacecraft and Agena had separated, the spacecraft unsuccessfully attempted to deploy its solar panels. Without solar panels, there was no solar power. Studying the telemetry from Mariner, building up piece-by-piece a picture of the trouble, and conducting failure-mode tests on the proof-test spacecraft, the operations teams commanded Mariner III to conserve power by switching off the scientific equipment, repeatedly commanded panel deployment, and were in the process of igniting the spacecraft rocket motor in an attempt to remove the nose shield by force when, eight hours, 43 minutes after launch, the spacecraft battery ran out of power.

Mariner's team wasted no time. The problem was identified, studied, and solved. A quick, thorough test program detailed and verified the conditions which had caused the failure. Experiments were conducted with fiberglass nose shields, and a new all-metal shield was designed, developed, and built in record time by the Launch Vehicle team. A little over three weeks after the launch of Mariner III, another Mariner/Atlas/Agena stood ready on the pad, with the new metal nose shield installed.

Countdown on Mariner IV

On November 27, the first countdown of the new Mariner was interrupted by

(Continued on page 4)

JPL PHOTO

(From page 3)

radio difficulties. On Saturday, November 28, at 1:37 in the morning, EST, the launch countdown began for the Atlas and Agena; the spacecraft was activated at 4:32 a.m. Launch operations crews went through the long list, establishing and checking communications, forecasting the flight weather, monitoring spacecraft and launch vehicle condition, filling the Agena oxidizer tank, and switching equipment into a state of readiness. At 9:22 a.m., EST, the clock had counted to zero without a hitch; the report was "clear to launch." Liftoff occurred 1.309 seconds later.

As it rose, the space vehicle rolled to an azimuth of 91.4 degrees, just South of due East, and began to pitch over from its vertical ascent. Shedding its two massive booster engines, Atlas carried on with the single sustainer. A ground computer fed guidance commands to the vehicle until the sustainer engine was shut down and the velocity properly adjusted with two small rocket engines. Then the huge, empty Atlas was detached and Agena took over. Before the Agena engine was started, the aerodynamic nose cover had to be jettisoned. As designed, it came off easily.

A Good Shot

Agena's 16,000-pound-thrust engine couldn't lift the weight of the Agena vehicle and the encapsulated Mariner spacecraft if they were on the ground. But starting at an altitude of 100 nautical miles and a velocity of 13,000 miles per hour, it could and did thrust Mariner to orbital velocity, about 17,500 miles per hour. The Agena engine then shut off, and the vehicle coasted for almost 41 minutes. Swinging around Earth to bear on its target, Agena flamed into action again. When Agena shut down for good, the spacecraft was traveling at 25,598 miles per hour along a path that led within 150,000 miles of Mars. The application of one-fifth of the spacecraft on-board propulsion power would bring that path within the desired target zone, between 4000 and 8000 miles above the planet's surface.

Launch operations were described as nominal; it was a good shot.

18,000,000 Measurements

During the eight months of flight, scientific instruments gathered data about the interplanetary magnetic field, the cosmic dust found in space, the solar wind, solar flares, and other deep-space phenomena. By the time Mariner reached Mars, it had taken approximately 18 million scientific measurements — enough to keep scientists busy for the next several years.

The interplanetary experiments will be of special interest; they may tell us, for instance, whether Mars is surrounded by a magnetic field like the Earth is, and whether there are intense radiation belts around the planet like the Van Allen belts around Earth.

3C System On-Board

The science data automation system served as a control center and data handler for the seven scientific instruments carried by Mariner IV. In the cruise mode, the science data automation system assembled data from the six interplanetary experiments, translated the information into constant-rate form, and transmitted it to the data encoder, where it was passed on to the transmitter, and eventually to Earth. During the encounter, some science data was sent directly to Earth while the picture data was being recorded.

The occultation experiment was the only experiment on Mariner that did not use a special scientific instrument. It relied on the telecommunications system and on the extraordinary accuracy of the flight path.

"Disappears"

About an hour after coming within 5600 miles of the Martian surface, Mariner seemed to disappear behind the planet (as viewed from Earth), entering occultation near Mars' south pole and emerged near the north pole. As Mariner seemed to disappear behind the Martian disk, its radio signals passed obliquely through the planet's atmosphere and were attenuated and bent, just as a stick appears to be bent when stuck into a pool of water. By measuring the changes in the characteristics of the radio signals, scientists hope to learn more about the composition and density of Mars' atmosphere.

Mariner IV signals the culmination of an era in spacecraft development and represents a powerful and refined body of new technology certain to affect the designer's work in the future.

Many important design lessons have been learned, and relearned, with this spacecraft, which may well prove a model for future interplanetary vehicles.

3C WILL DELIVER 76 COMPUTERS DURING LAST SIX MONTHS OF 1965

Seventy-six computers and special purpose systems that total more than $10,000,000 in sales, will be shipped by Computer Control Company Inc., during the last six calendar months of 1965, according to Benjamin Kessel, 3C president.

Circuit modules, core memories and instruments scheduled for the same period will account for another $4,000,000 in sales, Kessel said.

3C, which has been designing, manufacturing and marketing low-cost general purpose digital computers for only two years, will deliver the 76 computers and systems to a variety of military, research, industrial and aerospace customers.

In early '66, the 3C president added, the company will deliver its first DDP-124 microcircuit computer. 3C has also announced a new core memory — ICM-40, the industry's first integrated circuit one microsecond full-cycle core memory, which, like the DDP-124, incorporates the company's line of integrated circuit modules — μ-PACS, that were introduced early in 1965.

Computer Control, according to Kessel, will have a substantial sales increase for fiscal 1965 as compared with FY 1964. This he attributes to a considerable surge in sales during recent months, plus the fact that two new computers were released to full production early this year.

While 3C was founded in 1953, Kessel said, the company did not enter the computer manufacturing area until early 1964. However, 3C's extensive experience in design and manufacturing of digital logic modules, system fabrication, and special purpose system engineering set the stage for development and production of its low-cost, fast and flexible digital computers.

As a manufacturer of digital logic modules, 3C became the country's leading independent supplier, and now its computer capability, Kessel stated, has gained the company added recognition for its scientific capability in the military, industrial and aerospace markets. 3C computer applications have ranged from simulation of manned spacecraft flight to analysis of speech patterns.

DDP-124 MICROCIRCUIT COMPUTER ANNOUNCED

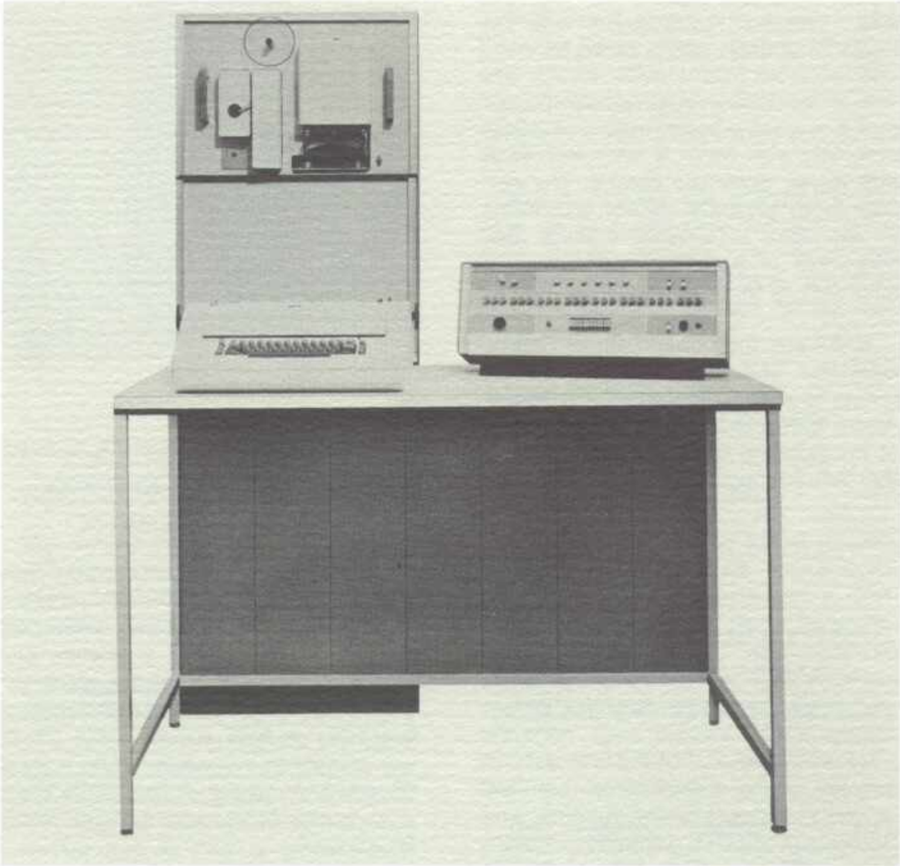
The DDP-124, a new 24-bit word computer constructed with monolithic integrated circuits, has been announced by Computer Control Company, Inc.

The microcircuit computer, designed to offer price, size, reliability and performance advantages inherent in integrated circuits, employs 3C's new module line of μ-PACS.

In announcing the new general purpose digital computer, 3C president Benjamin Kessel pointed to a broad range of control and simulation markets as areas of prime potential for the DDP-124 which will sell in the $65,000 range and be available after the first of the year.

3C, Kessel explained, has already made deep penetration of these markets with its DDP-24 and DDP-224 which have been sold for use in simulation systems for Apollo, Gemini and Lance Missile projects, as control systems for a number of commercial/industrial purposes such as mass transit control, and in science/research laboratories.

The DDP-124, fully parallel, may be applied to a variety of on-line, real-time systems uses, as well as general purpose open shop computation. It is capable of 285,000 computations per second, has a basic memory cycle of 1.75 microseconds with 0.8 microsecond access time, and multiplies in 14 microseconds. The new 3C computer includes 8,192 words of core memory optionally expandable to 32,768 words and is program compatible with DDP-24 and DDP-224 general purpose 3C computers.



DDP-124 computer performs up to 285,000 computations per second. Memory cycle time is 1.75 microseconds with 0.8 microsecond access time. Standard memory capacity: 8192 words; 24 bits per word. Memory expandable to 32,768. Full line of options, peripherals, and software.

The growing 3C computer capability was described by Kessel as somewhat unique in the industry due to the fact the company is the only computer house with extensive digital module and memory markets, as well as advanced systems design markets. He pointed out that these varied areas of activity tend to feed on each other to mutual benefit, and cited the NASA/JPL Mariner space probe program as evidence of "parlayed" capabilities.

3C research in microelectronics, Kessel explained, resulted in the company's delivering the data conditioning system aboard Mariner IV. He also called attention to the coordinate conversion computer — first computer produced by 3C — controlling the giant antennas at Goldstone, California, which are used in tracking space probes.

Not only has the system experience gained from controlling experiments aboard the spacecraft profited the company's computer development program, but the microcircuit research experience benefited the company in its modular circuit studies which recently culminated in the development of the company's new μ-PAC integrated circuit module line.

The DDP-124 extends capabilities and price spectrum of the firm's general purpose computer family which includes the DDP-116 ($28,500), DDP-24 ($73,000), and DDP-224 ($70,000).

3C SHIPS TWO DDP-224's TO LINK

Computer Control Company, Inc., has shipped two DDP-224 general purpose computers to Link Group of General Precision, Inc., where each will be tied into a multi-processor system for Apollo mission simulators being developed by Link at its facilities in Pleasantville and Binghamton, New York.

Each DDP-224 will join a computer complex which will generate simulated spacecraft instrument read-outs from information such as starting conditions, flight conditions, astronaut reactions, and simulated malfunctions of the Apollo spacecraft.

ARTIFICIAL LIMBS COMPUTER STUDIED AT CASE TECH

Case Institute of Technology will study computer control of artificial limbs (remote manipulators and orthotic structures) with a DDP-116.

The Institute's Engineering Design Center has purchased a DDP-116 digital computer with which it will experiment with digital multi-axis control. The purpose is to generate control algorithms in real time to execute actions over prescribed or optimized paths from a minimum of input data.

NASA and the Department of Health, Education and Welfare have provided grants to support the study. Professors James B. Reswick and Harry W. Mergler of the Center's Digital Systems Laboratory will conduct the experiments.

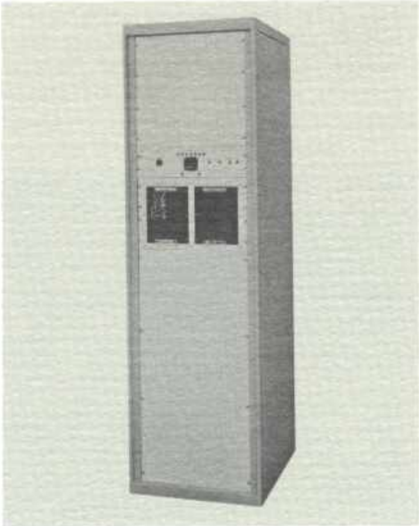
MELPAR TO USE DDP-24VM IN AIRBORNE SYSTEM

3C will deliver a DDP-24VM general purpose digital computer to be used in an airborne antenna-pointing and Doppler prediction computer system being built by Melpar Inc., a division of Westinghouse Airbrake Co., for the U. S. Air Force.

The equipment is to be used in Leap Frog, a project to determine the feasibility of extending the range of communications linking an aircraft in flight with a beyond-the-horizon ground station by using a satellite as a relay element. Leap Frog is a project of the Air Force Avionics Laboratory, Research and Technology Division, Wright-Patterson Air Force Base, Ohio.

The DDP-24VM will combine satellite orbital data and aircraft position and attitude data, permitting the aircraft's antenna to remain continuously pointed at the satellite. It will compute and control aircraft antenna-pointing angles every 0.2 seconds, with an accuracy of 1.25 degrees during a four-hour flight regardless of the motion of the satellite and aircraft.

The 3C computer employed is a ruggedized and modified version of the DDP-24 currently used in Melpar's flight simulators.



DIGITAL RESOLVER FOR WEAPONS SIMULATION

A Digital Resolver (DR-20) was shipped to the U. S. Naval Ordnance Test Station in Pasadena, California. The Digital Resolver is a satellite processor designed to generate algebraic, transcendental and other mathematical functions at high speeds. 3C's DR-20 will operate in conjunction with a Navy CP 624B computer at the NOTS Pasadena facility in weapons systems simultation work.

The DR-20 has a repertoire of 36 commands which allows the unit to be programmed to perform up to eight different coordinate transformations under computer control.

CALCOMP ORDERS DDP-116 COMPUTER

California Computer Products, Inc., has purchased a DDP-116 digital computer for use as the control element in test applications.

The DDP-116 will control functional testing of core buffers and Calcomp's 700 Series plotters, exploration of new applications for digital plotting systems, and check-out of plotting system subroutines.

Calcomp digital plotting systems are used to present digital computer output in pictorial or graphic form as annotated charts, graphs, maps or drawings. The systems consist of magnetic tape units connected to Calcomp plotters or digital plotters connected "on-line" to digital computers.

FIRST DDP-116 SHIPPED TO BUNKER-RAMO

The first DDP-116 digital computer produced by Computer Control Co., Inc., was shipped on schedule to the Bunker-Ramo Corporation.

The DDP-116 is designed for both open-shop scientific applications and real-time data processing, such as telemetry, data reduction, nuclear instrumentation, simulation and other electronic control applications.

Bunker-Ramo, first to receive the new DDP-116, will include it as part of a new series of Bunker-Ramo on-line electronic information systems known as the BR-335. This shipment constitutes the initial delivery in a long-term contractual agreement which makes 3C computer hardware available to Bunker-Ramo. The firm plans to market a broad line of computer systems.

3C TO EXHIBIT AT FOREIGN TRADE SHOWS

At the invitation of the U. S. Department of Commerce, Bureau of International Commerce, Computer Control Company, Inc., will exhibit computer products at two foreign trade shows this fall.

3C will participate in the Data Processing Equipment Show, October 1-7, in Milan, Italy; and Interkama, 1965, Third International Congress and Exhibition for Instrumentation and Automation, at Düsseldorf, Germany, October 13-19.

The 3C foreign exhibits will feature the DDP-116 general purpose digital computer and the company's new line of integrated circuit logic modules — μ-PACS.

WESTINGHOUSE, TI SUPPLY IC'S TO 3C

3C named Westinghouse as a supplier of integrated circuits, according to an announcement by Thomas G. Jennings, 3C vice president - manufacturing.

Westinghouse joins Texas Instruments in supplying integrated circuits according to proprietary 3C specifications.

Computer Control, largest independent supplier of packaged digital circuitry in the country, introduced its line of monolithic integrated circuit modules in March. 3C has also announced its new DDP-124 general purpose computer and ICM-40 integrated circuit core memory which will be built with monolithic integrated circuits.

SANDERS RECEIVES FIRST OF EIGHT DDP-224's

Sanders Associates Inc., Nashua, N.H., has received the first of eight DDP-224 general purpose computers from 3C in a contract totaling more than one million dollars.

The 3C computers will be used as the digital portion of the Saturn V operational display systems Sanders is building for NASA. The DDP-224's will collect data, format information, and distribute critical booster measurements to associated displays, thereby enabling personnel to evaluate the Saturn V vehicle's operational performance.

The display systems, an integral part of the automated acceptance checkout equipment for the launch vehicle, will interface with the Saturn V operational computer to establish the communications link between personnel and the vehicle under test and will provide real-time monitoring, command and emergency control capability.

LINK ORDERS FOUR DDP-224 COMPUTERS FOR LEM SIMULATORS

The Link Group of General Precision, Inc., has ordered four DDP-224 computers from Computer Control Company, Inc., for use in Lunar Excursion Module (LEM) Mission Simulators which will help prepare U.S. astronauts for landings on the moon.

The $1.8 million contract calls for installations at NASA's Manned Spacecraft Center at Houston and Kennedy Space Flight Center. Each LEM Simulator will employ two DDP-224 digital computers which will drive equipment simulating the lunar orbit of LEM as well as individual steps anticipated during the approach, landing and launch from the moon.

Each 3C computer, in addition to its own private memory modules, will share a common memory.

The LEM Mission Simulator will tie into the Apollo Mission Simulator which will provide the means for simulating the journey to the vicinity of the moon. The LEM Mission Simulator will complete the trip by simulating the manned lunar landing. Through use of both the LEM and Apollo simulators, astronauts will be able to prepare for the entire two-week Apollo mission.

Link is building two LEM Mission Simulators for Grumman Aircraft Engineering Corporation and two Apollo Mission Simulators for North American Aviation, both of which are prime contractors to NASA for the LEM spacecraft and the Command/Service Module spacecraft, respectively.

NASA ORDERS 3C DDP-224 FOR HUNTSVILLE LIEF SITE

3C will design and develop a data collector, distributor and control system for NASA's LIEF (Launch Information Exchange Facility) at the George C. Marshall Space Flight Center at Huntsville, Ala.

The system will serve to request, receive, display and record real-time pre-launch and post-launch information from Cape Kennedy, and will have a 3C DDP-224 computer as its central point of control for real-time data.

As the major message control computer, the DDP-224 will receive data through communication links from NASA Kennedy Space Flight Center, Fla. The data will be disseminated and identified for processing, at which time it becomes available for transfer to another large-scale computer.

Simultaneously, the DDP-224 stores data on magnetic tape for later reference. The 3C computer will also accept real-time data requests from operators to make changes in data format and redirection of data flow.

USERS GROUP MEETING AT IFIP

The second meeting of CAP (Council to Advance Programming) was held on Sunday, May 23, 1965, at the New York Hilton Hotel.

The organization invited users of Computer Control Company computers from organizations throughout the world to participate. Representatives met for the purpose of exchanging information concerning the use of 3C computers. A further aim of CAP is to exchange information relating to real-time and scientific application and to share in the use of programs developed for DDP's 19, 24, 224, and 116.

The 3C computer users group was chartered last November. Following the initial meeting, CAP officers elected were: Louis Myerowitz, General Electric Co., Philadelphia, president; James Norton, Grumman Aircraft, New York, vice president; Charles Cohn, Argonne National Laboratories, Argonne, Ill., Horace Fisher, Electronic Associates, Princeton, N. J., Frank Primer, G. E. Electric Boat Division, Groton, Conn., and George Sholes, Haskins Laboratories, New York City, executive board; George King, Minneapolis-Honeywell, Brighton, Mass., chairman, by-laws committee; and Mrs. Elinor Burns, Computer Control Co., appointed CAP secretary by Mr. Myerowitz.

The meeting at the International Federation for Information Processing Congress was the first of two scheduled this year. CAP will meet again at the Fall Joint Computer Conference.

DDP-116 FOR FREIGHT CAR SORTING

The Union Switch and Signal Division of the Westinghouse Air Brake Company (WABCO) has purchased a DDP-116 digital computer from Computer Control Company, Inc. The DDP-116 digital computer is used as the central control element of an Automatic Classification Yard System which applies the latest technical developments for sorting railroad freight cars.

The Automatic Classification Yard System provides automatic retardation and automátic switching of freight cars so that they can be assembled into trains for common destinations. The DDP-116 computer is programmed to control the alignment of track switches so that cars can be routed to the proper classification track. Detecting devices (field transducers) feed information to the computer which in turn determines the proper retardation required in order to deliver the freight car to its classification track at a safe coupling speed.

The DDP-116 is installed at the Southern Pacific Company's Classification Yard in Eugene, Oregon.

DDP COMPUTERS TO OHIO STATE

Ohio State University has purchased two general purpose digital computers from Computer Control Company, for use in its nuclear energy research program.

The University's High Energy Research Laboratory will use a 3C DDP-24 and a DDP-116 to perform high speed scientific computations.

POSITIVE/NEGATIVE PULSE VOLTAGE GENERATORS

3C has introduced a new Pulse Voltage Generator designed to convert programmed sync pulses from digital program generators, including 3C's 20 and 5 megacycle Digital Program Generators, into stable, variable parameter pulses for investigation and test.

Positive and negative Pulse Voltage Generators feature variable rise/fall times from 8 to 200 nanoseconds (at 50 volts) and pulse amplitudes from 0 volt to 50 volts.

Completely self-contained, 3C Pulse Voltage Generators provide variable trigger, delay, sync, width, rise time/fall time and output amplitude controls. They also incorporate internal triggering and sync output provisions, allowing one or more instruments to operate without program source.

Instrument applications include core memory exercising, testing and developing advanced storage devices, serial delay lines, research in cryogenics, as well as development of magnetrons and devices requiring short duration/high energy pulses.

Light-weight, portable 3C Pulse Voltage Generators function comfortably as either general bench-type laboratory instruments or as component elements within large test systems to meet a broad range of magnetic and solid state test and development requirements.

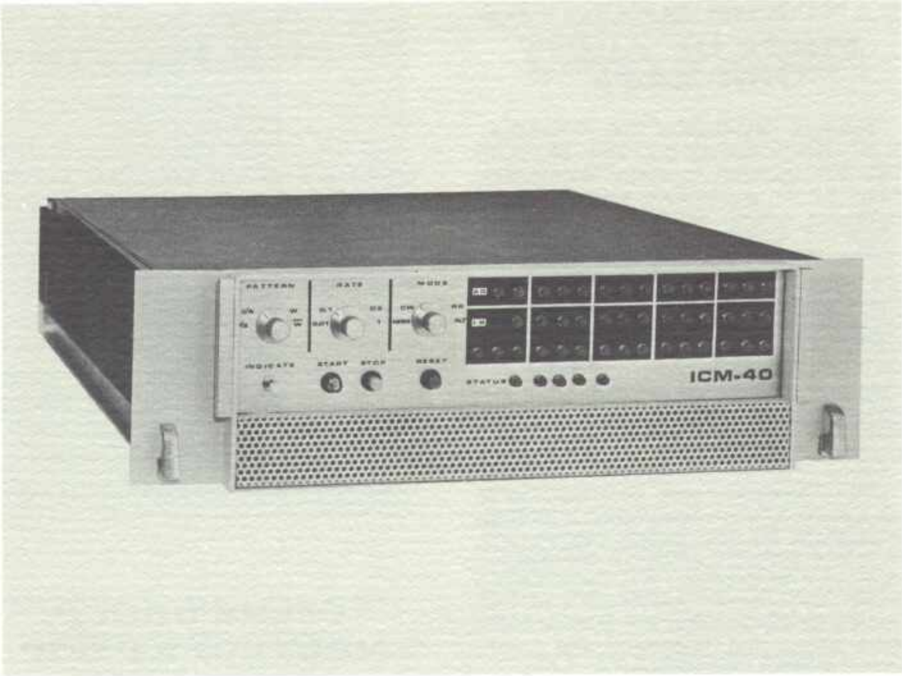
3C INTRODUCES NEW POWER UNIT

Computer Control Company Inc., has introduced a new 14-pound power unit, model 2050, a solid state instrument building block that is designed to combine with other instrument subassemblies to form completely self-contained pulse driver units.

Negative or positive current or voltage generators, combined with the power unit, form pulse drivers featuring variable rise time, fall time and output amplitude controls.

Operating from input gating signals, the power unit, with a suitable 3C plug-in generator, provides variable parameter pulses for a wide variety of investigation and test applications.

The light-weight portable power unit operates on 115 volts AC and provides all power required by any 3C plug-in unit being utilized.



1 uSEC INTEGRATED CIRCUIT CORE MEMORY INTRODUCED

Introduction of the first integrated circuit core memory series with operating speed of one microsecond full cycle and access time of less than 500 nanoseconds, has been announced.

The ICM-40 coincident current, random access core memory features price, size, and reliability advantages of 3C integrated circuits (μ-PACS). 3C introduced its integrated circuit line earlier this year.

The 5¼ inch high unit, designed for mounting in a standard relay rack with pull-out front-of-rack access, permits word capacities to 16,384. Standard operating modes include clear/write, read/restore, and read/modify/write cycles, while output signals include memory busy, information available, and end-of-cycle. Hold address control input is also available on the standard ICM-40, which interfaces with both discrete component and integrated circuit systems.

The new 3C integrated circuit core memory has an operating ambient temperature range of 0°C to +50°C. Its reliable operation over this range is ensured by use of all silicon microcircuitry.

Use of advanced design techniques for the new generation of 3C core memory products in no way diminishes the reputation of reliable storage devices which has been enjoyed by 3C since construction of its first fully transistorized memory system in 1958.

Power for the ICM-40 series comes from separate power supplies, each of which occupies 5¼ inches in a standard 19-inch rack. Each power supply contains power-failure sensing, nonvolatile start-up/shut-down, over voltage, over load, and line transient protection.

Flexibility of the basic ICM-40 is augmented by a number of standard options. In addition to the standard random-access mode of addressing, for example, the address register may be equipped for sequential addressing, address-out signals, and external count controls. Either two-zone or four-zone partitioning of the memory information register may be specified as a standard option, as may an external reset control for the information register.

A built-in memory tester unit, which may be specified with optional indicators for the address and information registers, is another standard option. If desired, the tester may be equipped to allow manual operation of the memory. A sequentially-operating memory-clear option also is available, as are up to four special marker pulses, which may be timed to conform with specific customer requirements.

LATEST 3C TECHNICAL LITERATURE
AVAILABLE ON REQUEST

The following library of technical information documents 3C activities in the digital products and digital systems industry. To obtain copies, circle the corresponding number on the information request card.

CATALOG, μ-PAC-1, details new 3C μ-PAC silicon monolithic integrated circuit digital logic modules. The new catalog features standard DC to 5 mc μ-PACS, as well as mounting hardware, power supplies and module accessories. Technical description, specifications and logic diagrams for each PAC type are included along with loading rules and typical waveforms. Number 1

CATALOG H-2 describes the full spectrum of 20 megacycle 3C H-PACS which offer new speed, new freedom from timing problems in complex systems configurations. Number 2

CATALOG S-3 details the full family of 3C S-PAC digital logic modules. More than 100 standard DC to 200 kc, DC to 1 mc, and DC to 5 mc digital logic modules are described in addition to mounting hardware, power supplies and module accessories. The catalog contains technical descriptions, specifications, logic symbols and schematics. Also included are loading rules, typical waveforms and new mounting hardware. Number 3

CATALOG SIL-1 introduces SILICON S-PACS, 1 mc digital logic modules, with full catalog information and specifications. Included are technical descriptions, schematics, loading rules, typical waveforms, mechanical packaging features, accessories, power supplies, and mounting hardware. Number 4

DDP-124 GENERAL PURPOSE DIGITAL COMPUTER — New brochure introduces first integrated circuit computer. Includes complete specifications, input-output options, peripheral equipment and software for the DDP-124. Number 5

DDP-116 GENERAL PURPOSE DIGITAL COMPUTER — Brochure describes general specifications, internal organization, command structure, input-output options, peripheral equipment, and software for the new DDP-116. Number 6

DDP-224 GENERAL PURPOSE DIGITAL COMPUTER — Brochure describes general specifications, input-output options, peripheral equipment and software for the DDP-224. Number 7

DDP-24 GENERAL PURPOSE DIGITAL COMPUTER — Revised brochure describes general specifications, input-output options, peripheral equipment and software for the DDP-24. Number 8

ICM-40 INTEGRATED CIRCUIT CORE MEMORIES featuring cycle times of 1 μsec are detailed in Catalog ICM-40. Includes complete specifications on newest core memory series. Number 9

TCM-35 MAGNETIC CORE MEMORIES featuring cycle times of 1.4 to 2 μsecs are detailed in Catalog TCM-35. Series TCM-35 coincident current core memories are offered in word lengths up to 36 bits, word capacities up to 8192 (basic module). Number 10.

TCM-32 MAGNETIC CORE MEMORIES designed to fill a wide range of word length capacities presented in Catalog TCM-32. TCM memories feature flexible component assembly for use with digital systems requiring high speed random access storage, or for buffering and high speed changing operations. Number 11

20 mc DIGITAL PROGRAM GENERATORS featured in catalog DPG-2 are solid state, variable frequency, multichannel pulse train generators. Number 12

5 mc DIGITAL PROGRAM GENERATORS featured in Catalog 5 mc DPG-1 are designed specifically for applications where serial/parallel pulse patterns are required. Number 13

3C PULSE CURRENT GENERATORS provide trigger control, delay, sync, width, output shaping, and output amplitude controls. Number 14

PULSE VOLTAGE GENERATORS featured in four-page catalog PVG-1 specifications and applications of 3C's recently introduced positive and negative Pulse Voltage Generators. Number 15

TIMING/POWER UNITS presented in Catalog TP-1 are designed to combine with other instrument sub-assemblies to form completely self-contained negative or positive Pulse Current and Voltage Generators. Number 16

POWER UNITS featuring new light weight modular instrument capabilities are introduced in Catalog P-1. Number 17

SPACE CAPABILITIES — Revised brochure describes 3C's experience in design and development of special purpose digital systems for space applications — both ground based and spaceborne. Number 19

FOR MORE INFORMATION ON TOPICS DISCUSSED IN PULSE, FILL OUT THE ATTACHED READER SERVICE CARD.

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