

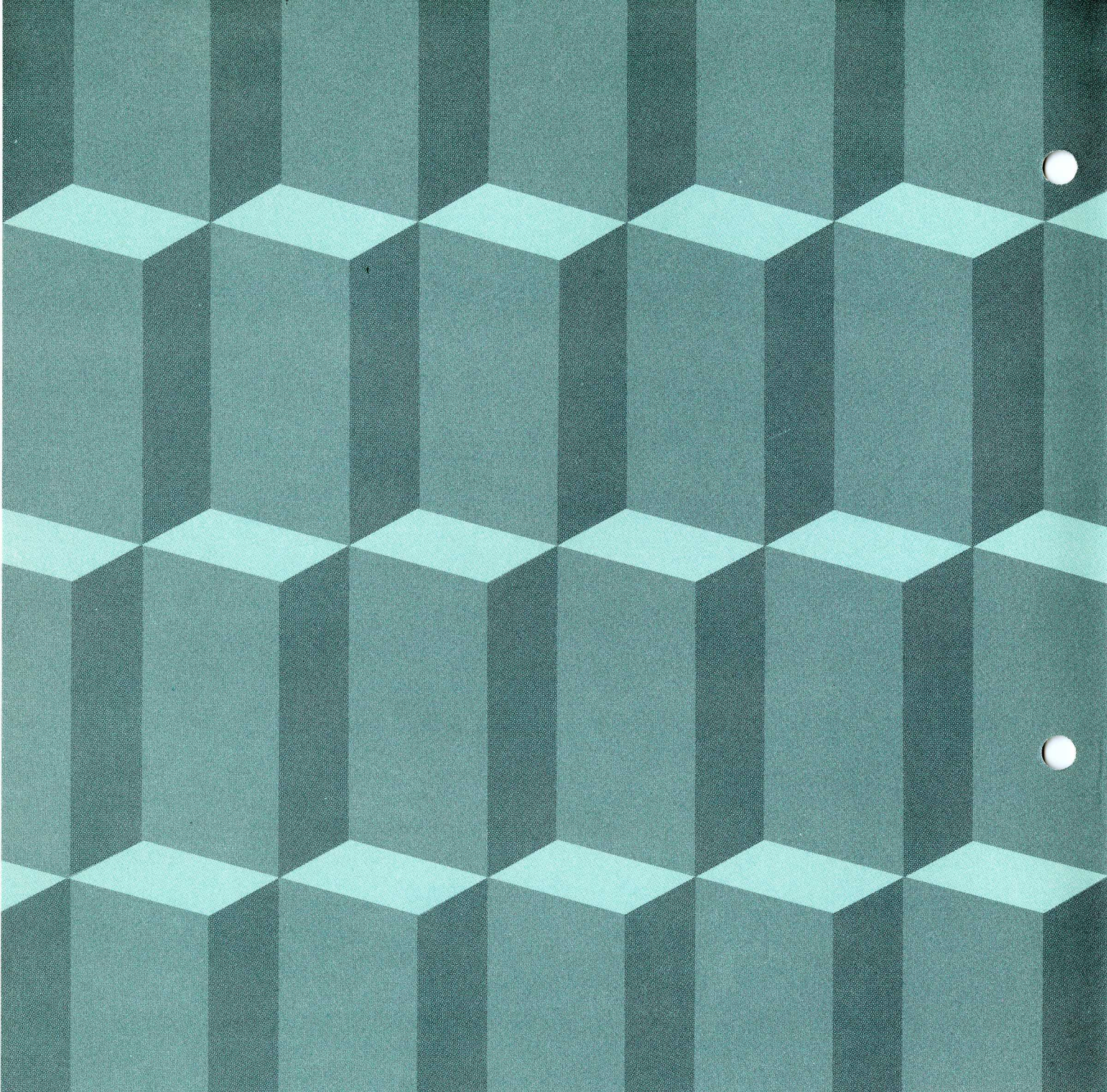


# MARTAC

# 420

FROM MARTIN COMPANY • A MULTIPURPOSE DIGITAL CONTROL COMPUTER





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WHAT IS MARTAC 420?  
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Checking autopilot performance, controlling prelaunch operations that send a missile roaring toward space, or rapidly making the hundreds of precision measurements used in factory acceptance testing—the MARTAC 420 was designed to perform these operations and many more.

Since MARTAC 420 is automatic, multipurpose, digital, and computer-controlled, it has the built-in advantages of rapid, automatic control of testing, automatic evaluation of test readings, and automatic, standardized recording of test data. These advantages minimize human errors, reduce wear during testing, and provide more useful statistical data for constructing performance history and reliability figures.

Note these important design features.

- Fully integrated solid state circuits\*
- Real time self-checking of all data transfer and decision circuits
- Central and remote unit operation provide alternate methods of installation and operator convenience
- Programming is easily done by means of an auxiliary program preparation unit — no intermediate translation steps are required

\*Fairchild Corporation Micrologic ® Circuits



## MARTAC IS DESIGNED FOR YOU!



### MANAGEMENT

New business proposals demand state-of-the-art equipment. Holding on to existing business requires personnel and equipment that can readily adapt to changing needs. MARTAC 420 can assist your technical operation in both areas.

The MARTAC central unit can be located almost anywhere and several remote measurement units may be placed strategically to monitor operation of key equipment. Only two coaxial lines (up to several miles long) connect the units to the central control, channeling vast amounts of information to the central unit for comparison with the pre-set standards.

The MARTAC price is competitive, with the additional bonus of the exclusive performance and reliability features of this Martin-developed unit.

Because it is useful in relieving the workload of engineers and production superintendents, MARTAC will release executive talent for the basic job of leadership and creativity.



### SYSTEMS DESIGNER

When major equipment purchases are made, naturally the design engineer wants a unit in the forefront of the state of the art — a unit that will fit in with future design requirements regardless of industry changes and the direction of company product investigations.

Consider MARTAC. With facilities for remote checkout control and monitoring miles from the test site, the unit design is applicable to many types of ground installation under various environmental conditions. The system and circuit design are suitable for airborne application; only packaging methods would require redesign.

Optional and growth attachments are a part of the MARTAC 420 development program: arithmetic computers, converters, data loggers, magnetic and tape-punch/card-punch units, digital input-output selectors, rf data links for remote operations, and switching units for multiple site locations.

System reliability is built-in with the most advanced techniques available: welded modular Micrologic\* circuits, reed relays, 3-wrapped connections, photoelectric tape reader, and flat wire cabling. Failure modes are fail-safe, and self-checks are performed on all data transfer. Critical circuit lengths are held to a minimum.

If you are bidding on aerospace projects now, if you plan to enter this field in the near future, if you want to be sure of completing your research on time, investigate the MARTAC 420.

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### PURCHASING AGENT

Major equipment inventory investments must return dividends continually during the useful life of the unit. The MARTAC 420 design assures the maximum possible return on your investment:

- 1) Company competitive status is markedly improved in new business proposals;
- 2) MARTAC advanced state-of-the-art design protects your investment against technological obsolescence;
- 3) MARTAC has the adaptability to meet many different directions of Company development—and to smooth the transition between technical plateaus and management decisions;
- 4) MARTAC welded circuit and relay modules are standardized to simplify maintenance and reduce spare part inventories.

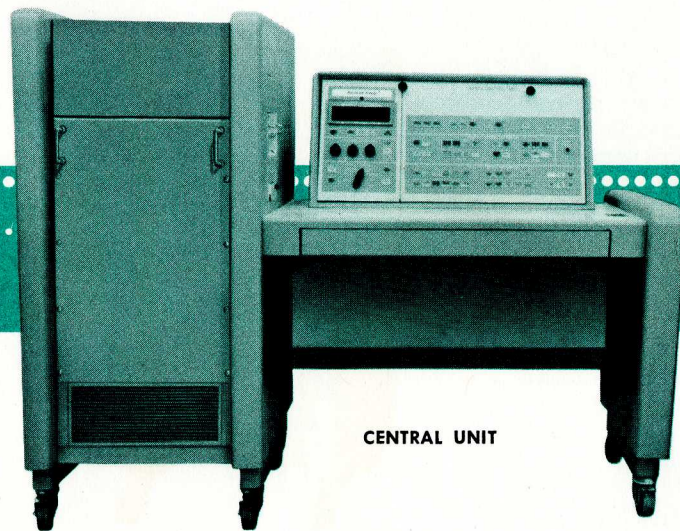
Interested? Contact the Martin representative listed in this brochure for prices, installation surveys, maintenance arrangements, and operator training facilities to suit your particular needs.



## DESIGNED FOR YOUR CHECKOUT AND CONTROL PROBLEMS

Design of the MARTAC 420 was based on the principle of versatility: to meet the requirements of your organization and still avoid the limitations of general purpose equipment. The assignment was met in part by the pace-setting design features already described. In addition, MARTAC incorporates these leading features now considered essential in a space-age control computer:

- Building block techniques are used throughout for ready application to large and small jobs alike
- More than 100 different decisions based on test results can be built into the equipment
- Either automatic, semiautomatic, or manual operation may be set up
- Safeguards are built in against machine and operator errors
- Punched tapes serve as built-in memories—changeable at will by all engineering personnel to incorporate new test values, sequences, and equipment changes



Careful attention has been given to other details to assure maximum reliability, flexibility, and operator convenience.

**PERFORMANCE SPEED:** tape reading speed of 1000 characters per second allows control of discrete outputs at rates up to 30 per second; complete test operations involving ac or dc voltage measurements at rates up to 20 per second are possible

**SIMPLIFIED PROGRAMMING:** the block data format solves programming problems in *test* terms, not computer terms, permitting engineers and technicians to program their own check-out routines; the large selection of instructions provides the versatility to handle the vast majority of checkout problems

**BUILT-IN STRUCTURAL RELIABILITY:** welded modules and wire-wrapped interconnections throughout; all module terminals accessible as check points while system is operating; two coaxial lines needed between units; all conversion done at remote units (only pulses sent to central unit); analog to pulse conversion periods variable from 0.01 to 10 sec during signal sampling

**BUILT-IN OPERATIONAL CONVENIENCE:** protection against operator entering loop at hazardous point; protection against operator stopping at hazardous point





## BASIC MARTAC 420 PERFORMANCE

The MARTAC 420 performance parameters were carefully selected to provide the greatest possible accuracy and speed after the basic requirements were met.

Provision is made for 255 data inputs in either ac or dc form and 254 outputs, typically 28 vdc up to 4 amperes. The number of inputs and outputs can be tailored to fit any requirement by varying the units in multiples of 16. Pulse coded output signals can also be provided in word lengths up to 27 bits at 1000 cps.

The table of voltages and accuracies below shows the wide range of application of this advanced unit.

TYPE OF MEASUREMENT	NO. OF RANGE STEPS	FULL-SCALE ON LOWEST RANGE	FULL-SCALE ON HIGHEST RANGE	INPUT IMPEDANCE	FREQUENCY RANGE	MAXIMUM ERROR
Voltage, dc (volts)	15	±10 millivolts	±500 volts	10 megohms	(dc)	±0.1% of reading above 1/3 full scale
Voltage, ac (volts, rms)	12	100 millivolts, rms	500 volts, rms	10 megohms	60 to 10,000 cps 20 to 100,000 cps	±0.2% of reading above 1/3 full scale (sine wave) ±1.0% of reading above 1/3 full scale (sine wave)
Resistance (ohms)	12	1000 ohms	5 megohms	— —	— —	±0.5% of reading above 1/3 full scale (open-circuit recovery 50 milliseconds)
Ratio, dc/dc Voltage	5	1.0	10,000	10 megohms	(dc)	±0.5% of reading Vref above 10% full scale
Ratio, ac (rms)/ac (rms) Voltage	5	1.0	1000	10 megohms	60 to 10,000 cps	±0.6% of reading Vref above 10% full scale (ac sine wave)
Ratio, dc/ac (rms) Voltage	5	1.0	1000	10 megohms	dc/60 to 10,000 cps	±0.5% of reading Vref above 10% full scale (ac sine wave)
Ratio, ac (rms)/dc Voltage	5	1.0	10,000	10 megohms	60 to 10,000 cps/dc	±0.5% of reading Vref above 10% full scale (ac sine wave)
Interval (seconds)	4	10 milliseconds	10 seconds	50 ohms	Single pulse to 1 mc	±2 Parts in 10 <sup>6</sup> (0.0002%) per week ±1 Count, trigger jitter ±5 nanoseconds
Interval, High Resolution (seconds)	2	100 microseconds	1 millisecond	50 ohms	Single pulse to 1 mc	±5 Parts in 10 <sup>8</sup> (0.000,005%) per day ±1 Count, trigger jitter ±5 nanoseconds
Phase-Delay or Period (seconds)	4	10 milliseconds	10 seconds	0.25 megohm	0.1 to 5000 cps	±2 Parts in 10 <sup>6</sup> (0.0002%) per week ±1 Count, trigger jitter ±10 nanoseconds
Phase-Delay or Period (high resolution) seconds	2	100 microseconds	1 millisecond	0.25 megohm	0.1 to 5000 cps	±5 Parts in 10 <sup>8</sup> (0.000,005%) per day ±1 Count, trigger jitter ±10 nanoseconds
Frequency (cps)	3	10 kc per second	1 mc per second	1.0 megohm	100 cps to 1 mc	±2 Parts in 10 <sup>6</sup> (0.0002%) per week ±1 Count
Discrete Time Series (mark pulse) seconds	1	1000 seconds	1000 seconds	50 ohms	Single pulse to 10 kc	±1 Part in 10 <sup>4</sup> (0.01%) per day ±1 Count
Time Delay (seconds)	1	1000 seconds	1000 seconds or up to 100,000 seconds, 100 repeats			±1 Part in 10 <sup>4</sup> (0.01%) per day ±1 Count

**NOTES:** 1. All inputs are floating and provide for electrical isolation of the circuits under test from each other and from the MARTAC.

2. 120 db common mode rejection normally provided by shielding, isolation, and optional guarded input (when required).

3. Voltage and resistance over-scale up to approximately 30% is possible with slight degradation in accuracy. Exceeding the scale will be indicated with the over-scale reading. Excessive over-scale results in amplifier blocking which may require up to several seconds to clear after removing the input signal.

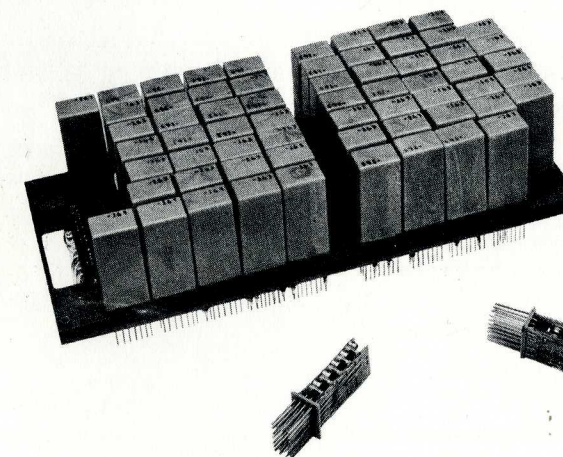
## RELIABILITY BUILT-IN

MARTAC 420 accuracy and reliability are safeguarded by the use of encapsulated, solid state, plug-in modules including Micrologic\* elements. Micrologic elements are formed of etched silicon chips 1/16-inch across. Selected impurities of boron, phosphorus, aluminum, and tungsten are evaporated onto the correct areas of the etched surface to form transistor and resistor elements, etc., with the appropriate interconnections. Pigtail leads are welded to the terminal pads around the periphery of the assembly element. These pigtail leads are welded, in turn, to the remainder of the circuitry prepared by Martin in the plug-in modules.

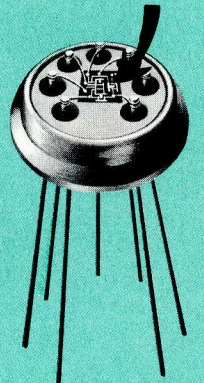
The Micrologic elements are severely tested by mechanical shock, temperature cycling, and centrifuge acceleration tests. In addition, Martin performs additional tests on the assembled plug-in module. The entire module is then encapsulated in a solid block and assembled in its plug-in cover. The all-welded construction of the plug-in module — from the tiniest transistor to the socket pins on the end of the module — assures tremendous resistance to vibration, humidity, and all other environmental disturbances.

**THE DIFFERENCE IN PLUG-IN MODULES—**Don't confuse the MARTAC 420 plug-in modules with similar-appearing circuits assembled from soldered, standard-size components. The accuracy, reliability, service life and number of functions performed by each MARTAC module far exceed the performance of any comparable module.

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MICROLOGIC CIRCUIT CHIP



Capped Micrologic Element from Vendor is Incorporated in Martin Welded Circuits and Encapsulated in Plug-in Module



## APPLICATIONS

MARTAC 420 is a second-generation computer designed for wide application throughout the aerospace, electronic and industrial control fields where reliability, accuracy, and versatility are important.

**AEROSPACE**—As launching pads begin to resemble busy airline terminals of the present, and the variety of space vehicles continues to grow, the demands on automatic checkout equipment become increasingly more critical.

MARTAC 420 has the built-in versatility to match the requirements now developing—whatever their direction. The MARTAC system is not tied down to any computer “language”—engineers set up their own control tapes with no intermediate translation problems.

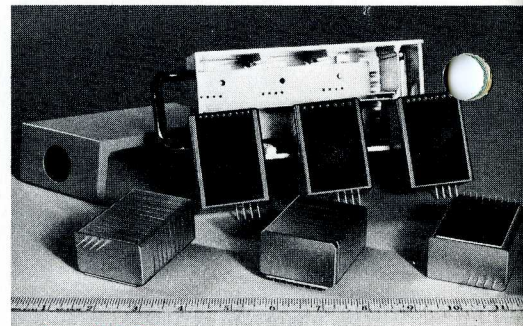
In ground control units, MARTAC is suitable for:

- Launch control and checkout
- Telemetry stations checkout and control
- Booster, space vehicle, and payload checkout on location
- Space vehicle control and guidance checkout

Future development of MARTAC will be suitable for spaceborne application; a miniaturization study program is now in progress.

**INDUSTRY**—Diversification trends in corporation expansion today demand that capital investments be carefully placed in areas producing returns wherever the corporation expands. MARTAC 420 was designed for control applications such as these:

- Nuclear reactor operations
- Chemical industry operations and pilot plants
- Aircraft circuit checkouts and verifications
- Electronic manufacturing assembly and subassembly checkout
- Petroleum industry laboratories



## MARTIN-MARIETTA ELECTRONIC CONTROLS EXPERIENCE

MARTAC 420 incorporates the years of experience gained in designing launch control, checkout, and maintenance equipment. Martin's electronic work was in such programs as Matador (1951), Mace (1955), Lacrosse (1955), and Titan I and II R&D and operational AGE (1956 to present).

**MARTAC'S PEDIGREE**—MARTAC is a descendant of the ICBM launch and checkout systems which have successfully met the severe environmental and operational requirements at the Atlantic and Pacific missile ranges and the SAC operational bases.

MARTAC incorporates the experience acquired in this demanding service. In the R&D checkout and launch control systems, design emphasis was on flexibility, versatility and reliability; in the operational systems, the first design requirement is simplicity and reliability. Both R&D and operational designs involved new concepts in logical design, checkout, and reliability techniques.

Whatever the requirements, you can be sure that Martin Company equipment will remain at the forefront of the state of the art. Contact your nearest Martin sales office and let them prove it to you.

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