THE T-MATIC™ VIDEOCASSETTE PROGRAM AUTOMATION SYSTEM

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The potential for local origination in CATV is almost limitless. With multiple channels available and few constraints on the manner in which these channels are utilized, cable systems could originate many hundreds of hours of program fare per week. When compared to this potential, local origination to date has been a failure, the principal reason being economic factors. These economic factors can be defined by three letters—"CPM"—the advertiser's jargon for cost per thousand viewers. The cost of program fare has been tied to broadcast stations who typically serve ten to one-thousand times as many sets as cable systems in the same market. The cost of local origination equipment, while lower for cable than for broadcast, is still high when viewed on a cost-per-thousand basis. Most significant are the operating costs. Cable systems, if they are to be competitive, have to employ the same quantity and type of personnel to program a single cable channel as a broadcaster requires to program his channel. Again, on a cost-per-thousand basis the cable operator's expenses are sky high.

Times are changing. The software owners, to whom cable was just a dirty word two years ago, are at this convention in force anxious to capitalize on what they know will be a lucrative new market for them. It's a safe bet that the cost-per-thousand to the cable operator will be significantly reduced as competition for his dollars heats up.

My talk today involves developments that will affect the other two economic factors mentioned, equipment costs and operating costs. The recent development and introduction of the Sony U-Matic videocassette equipment is the key factor in reducing these costs. At $995, the videocassette player is less costly than any previously available color videotape equipment, while in terms of picture quality it is more nearly comparable to open-reel machines in the $4,000 to $8,000 price range. These cost and quality considerations plus the very enthusiastic acceptance that this format has received to date tell me that the 3/4" cassette will substantially replace 16 mm film as the principal duplication and distribution medium for entertainment software in our industry. This means that instead of tying up a $20,000 film chain running a $400 print that becomes unusable after 15 showings to program a single channel, the cable operator will be able to offer multiple channel programming using $995 decks with per-run print costs measured in pennies rather than dollars.

Two down and one to go. The videocassette reduces the equipment cost and the print cost but someone still must load, pre-cue, start, stop, and rewind the machines. Someone also has to switch audio and video; and, since a reasonably professional transition from one program source to another requires that all of these things be done at once, that someone is more likely to be two someones.

FM stations a few years back found themselves in a similar situation, squeezed between limited revenues and high operating costs. They were saved from economic disaster by a concept known as program automation. FM broadcasters that recognized the wisdom of spending $40,000 to $80,000 to convert to unmanned operation are generally alive and well today.

TeleMation has developed a program automation system analogous to those used by FM stations except that this system was developed for the CATV industry and does its thing in living color television rather than audio only. Its price, instead of being $40,000 to $80,000, is more like $5,000 to $10,000. We call it the T-MATIC™ Program Automation System. We believe it embodies the necessary features to permit continuous unattended programming of better quality and in a more professional manner than is generally provided by manually operated systems. It provides automatic pre-cueing, starting, stopping, rewinding, and program switching between any number of Sony U-Matic players or between its own players and external program sources. Features such as digital tone decoding, solid state audio and video switching, automatic pre-roll to attain machine lockup prior to switching, and a selection of various internal and external transition modes permit a quality and continuity of programming approaching broadcast standards.

This slide shows the T-MATIC console. It is equipped with lockable front and back doors to permit its being located in public access areas. The cabinet is pressurized with filtered air to minimize dust problems that would shorten head and tape life. The next slide shows the console with the front door open. Four tape decks can be mounted in the cabinet. The control panel mounts at the top, while $10\frac{1}{2}$" of rack mounting space is provided in the bottom to permit installation of modulators or other equipment. Casters are provided to facilitate rear access while using a minimum of dedicated floor space.

The next slide is a view of the control panel. The group of switches on the left are for event control, the next group are for machine selection, and the last group are for program switching. The switches and indicators in each horizontal row are associated with a single event--an event being a transition from one program source to another. At the far left in each event row is a SKIP switch. When a SKIP switch is depressed, its event is removed from the sequence. In installations involving only two or three players, SKIP switches are used to limit the number of active events to those required to sequence between the machines and/or program segments actually used.

Before describing the mode selection switches I will digress for a moment and discuss the concept of cueing. Cue signals are tones placed on one of the two audio tracks to accomplish the following tasks:

1. Pre-cue tapes at the time the machines are loaded.

2. Pre-roll machines to achieve servo and color lock-up prior to airing.

3. Switch audio and video from one machine (or external source) to another.

4. Stop machines after completion of a program segment.

5. Rewind machines after the last segment on each reel is played.

6. Pre-cue tape to start position after rewind is completed.

7. Insert commercial or promotional announcements at appropriate breaks in the program material with all of the machine control and program switching functions handled automatically.

The T-MATIC system uses three cue tones to accomplish these tasks:

> The START cue is placed at the beginning of each reel. Its principal use is to pre-cue the tape to the start point when initially loaded or following the automatic rewind cycle. It is placed four seconds before actual start of programming to provide adequate time for machine lock-up prior to program switching.
>
> STOP cues are used where a tape is to be interrupted but not rewound. STOP cues are placed on the tape four seconds prior to the actual stopping point to permit pre-roll of the next source.
>
> END cues are recorded four seconds before the end of the last program segment on each reel. The END cue performs the same starting, stopping, and switching functions as the STOP cue. In addition it causes the tape to be rewound and re-cued ready to be aired again.

There are six switches associated with each event to determine the source and mode of program transition. The first three permit selection between the START, STOP, and END cues picked up from the machine in play. The last three buttons permit control from various external sources such as a live studio, non-duplication programmer, or from other T-MATIC consoles. Selecting any one of the six controlling sources locks out all others—Thus the operator can select the right transition mode even though there may be more than one cue tone at a program break.

The programmer provides for six actual events (numbered 1-6) and one virtual event, which we label "the reversion event." The reversion event has been incorporated to permit repetitive insertion of material, generally promotional or commercial announcements from a single machine with programming

reverting to the previous event in play upon completion of the announcement. Without this reversion capability it would be necessary to use up two of the six events for each announcement inserted. With the reversion feature, the six events are preserved for transitions from one program machine to another or between external sources and the T-MATIC system. The transitional mode between the program deck and the reversion deck is determined by two sets of switches. Normally STOP cues are used for both entering the reversion mode deck and returning to the program deck.

The reversion enable switch associated with each event permits the operator to override the reversion mode. If the reversion mode is not enabled, programming sequences to the next unskipped event upon sensing the selected cue tone.

The manual take switches can be used to preset or override the event counter. These switches can also be duplicated remotely to permit external manual or machine control of the system.

The next event and event-in-play lights provide a quick visual check of the system status.

The machine selection buttons permit full machine assignment flexibility. Up to five sources can be handled by the system. In most configurations these sources will consist of up to four videocassette decks plus one external source.

The two rows of vertical switches on the right control the program and monitor switcher busses. Program switching is normally handled automatically by the programmer so this switch will be used only for emergency operation where direct manual access to a given machine is required. The video and audio outputs from the monitor switcher normally go to a monitor mounted on top of the console. This switch permits monitoring any of the decks while off-line for checking program material without interrupting the on-air operation. A sixth position of this switch permits continuous monitoring of the program line out. Video test points are provided at the output of both switcher busses, while a switchable VU meter permits monitoring of either program audio as selected by the program or monitor switcher bus or cue channel audio as selected by the monitor switcher bus.

The next slide is a rear view of the console showing the electronics card cage. The next slide shows the card cage by itself. All of the active electronics are mounted on these circuit boards. A board extender is included with the system to facilitate servicing the electronics while in operation. Reading from left to right, the first five circuit card slots accommodate either Machine Control Modules or External Control Modules. The picture shows four Machine Control Modules and one External Control Module installed. Each Machine Control Module provides AC power to its associated deck. The control cable connects to the

Control Remoting Module attached to the front of the machine for operating the PLAY, STOP, and REWIND keys. Normally only two of the audio input jacks are used, one for program and one for cue audio. The third audio jack is in anticipation of stereo applications where, by means of an external filter, the cueing signals can be separated from the program material. The terminal board on the External Control Module provides connections for cueing and control signals to and from other T-MATIC consoles or external controls and sources. Video and audio from the external sources are switched to the program output line when the external source is selected by the programmer. Next is the output amplifier card providing both program and monitor audio and audio and video outputs. The master logic circuit card contains the various counting and timing circuitry required for the programmer. The last four slots accommodate event control cards. Each of these cards contains the logic circuitry associated with three events. The normal configuration provides for two cards controlling six events. The two remaining slots would allow for the addition of two more Event Control Modules. These additional modules along with an event expander panel would increase the system's capability to 12 actual plus one virtual event. The expander panel is not yet available and will only be manufactured based on a demonstrated need for event expansion.

The terminal strip along the bottom of the card cage permits external control of individual events. The next series of slides shows the electronics modules removed from the card cage. First is the Machine Control Module. It provides power to the cassette machine and includes the logic and driving circuitry for the remote operation of the machine controls. It incorporates tone sensing and five video and audio switcher cross points. The next slide is the External Control Module. Next is the video and audio amplifier card. The next slide is the master logic card. It incorporates all of the electronics except that which is peculiar to either machine control or event control. Next is the Event Control Module.

The next slide shows the Sony VP-1000 Videocassette Player. This player, in addition to providing good color reproduction, is expected to be very reliable in CATV applications. This expectation is based on extensive life testing recently completed by a major industrial concern, and the cassette concept eliminating a major source of equipment failures by reducing mistreatment during loading and unloading operations. Another feature of the Sony machine that makes for ease of automation is its automatic end-of-tape sensing at both the beginning and end of the tape. The machine is, in fact, ideal for incorporation in an automation system, except in one regard—it is not designed for remote control. The keys that control the fast forward, play, stop, and rewind functions perform many mechanical as well as electrical functions, therefore making it impossible to convert the machine to remote control through electrical modification only. This fact plus our desire to leave the basic machine unchanged led to the development of the T-MATIC Control Remoting Module.

The player is shown with the T-MATIC Control Remoting Module installed. The next slide shows it with the cover removed. The next slide shows the machine side of a Control Remoting Module. In operation, one of three solenoids is energized to pick the correct operator while the drive motor goes through one revolution. The three operators are mounted on a carrier that is cam operated from the drive motor moving in a vertical plane. Using the motor to power the key actuation treats the machine more gently as well as allowing use of very small solenoids. Since the solenoid is already in contact with the bottom of the operator when it is energized, it requires only about one one-thousandth of the energy to exert a given pull as would be required if the solenoid itself were to power the key actuation.

The last slide shows a small cue tone generator that we have developed for the convenience of both T-MATIC users and duplicating centers. Several of these units have already been distributed to duplicating centers. We expect that all centers equipped to produce Sony U-Matic dups will be equipped with these generators within the next few weeks.

Some of the applications of the T-MATIC system for CATV are:

As a free-standing program source to program a separate channel on the system, a single T-MATIC console can provide up to five hours of programming while two consoles can provide eight hours of programming. This programming can be continuously repeated for 24-hour-a-day unattended operation.

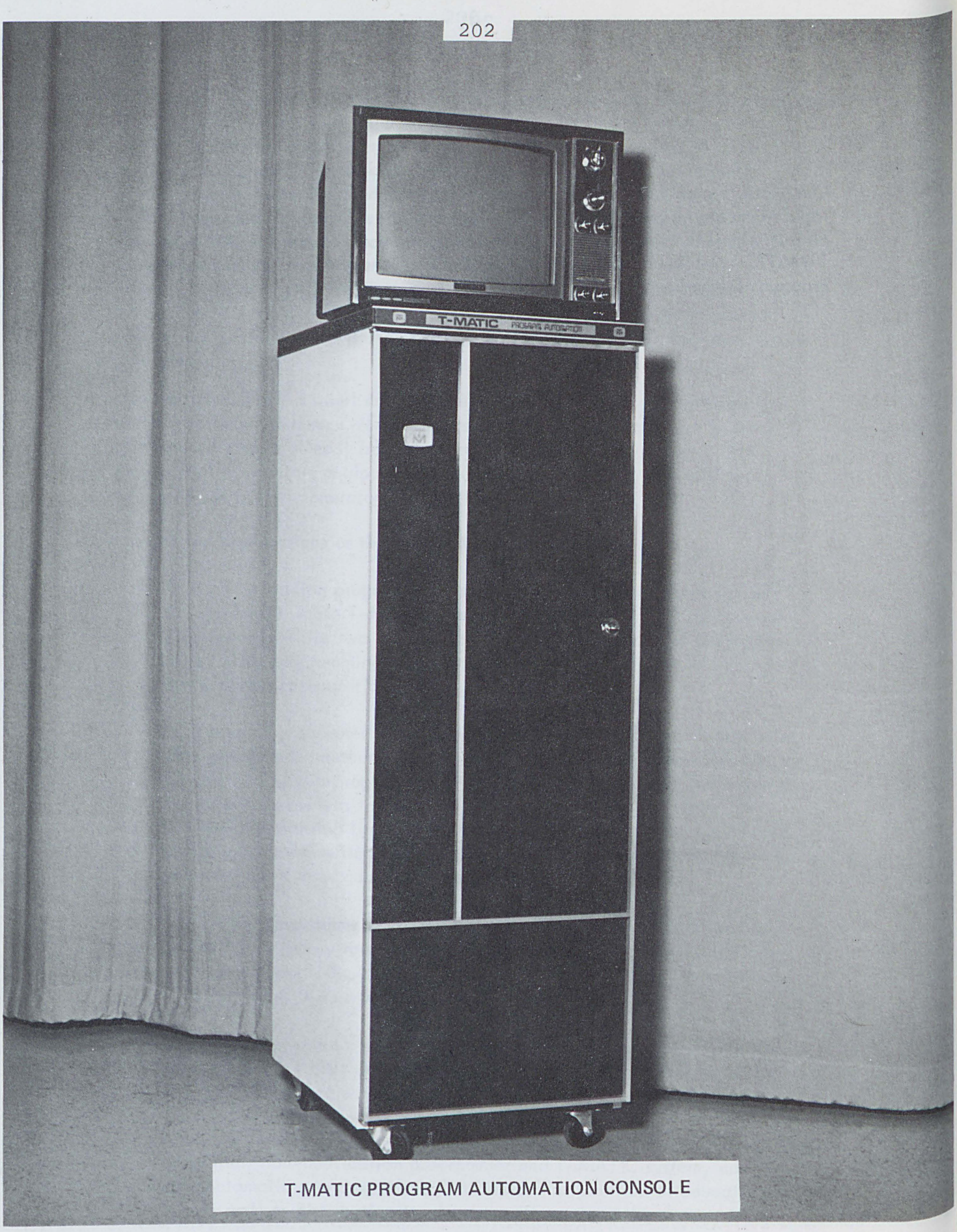
As a manually accessed program source, the T-MATIC system can provide commercial announcements, feature stories, and news clips to support live studio programming. A small desk top control box permits the talent themselves to access the various T-MATIC machines. A four-second warning light on the same control box tells the announcer of the impending switch back to live camera operation. A strictly one-man news show can thus be a reality.

The T-MATIC system can be used as a source of non-duplication programming by simply routing the audio and video from the station to be protected through the T-MATIC switcher and controlling the switcher from the system's non-duplication programmer.

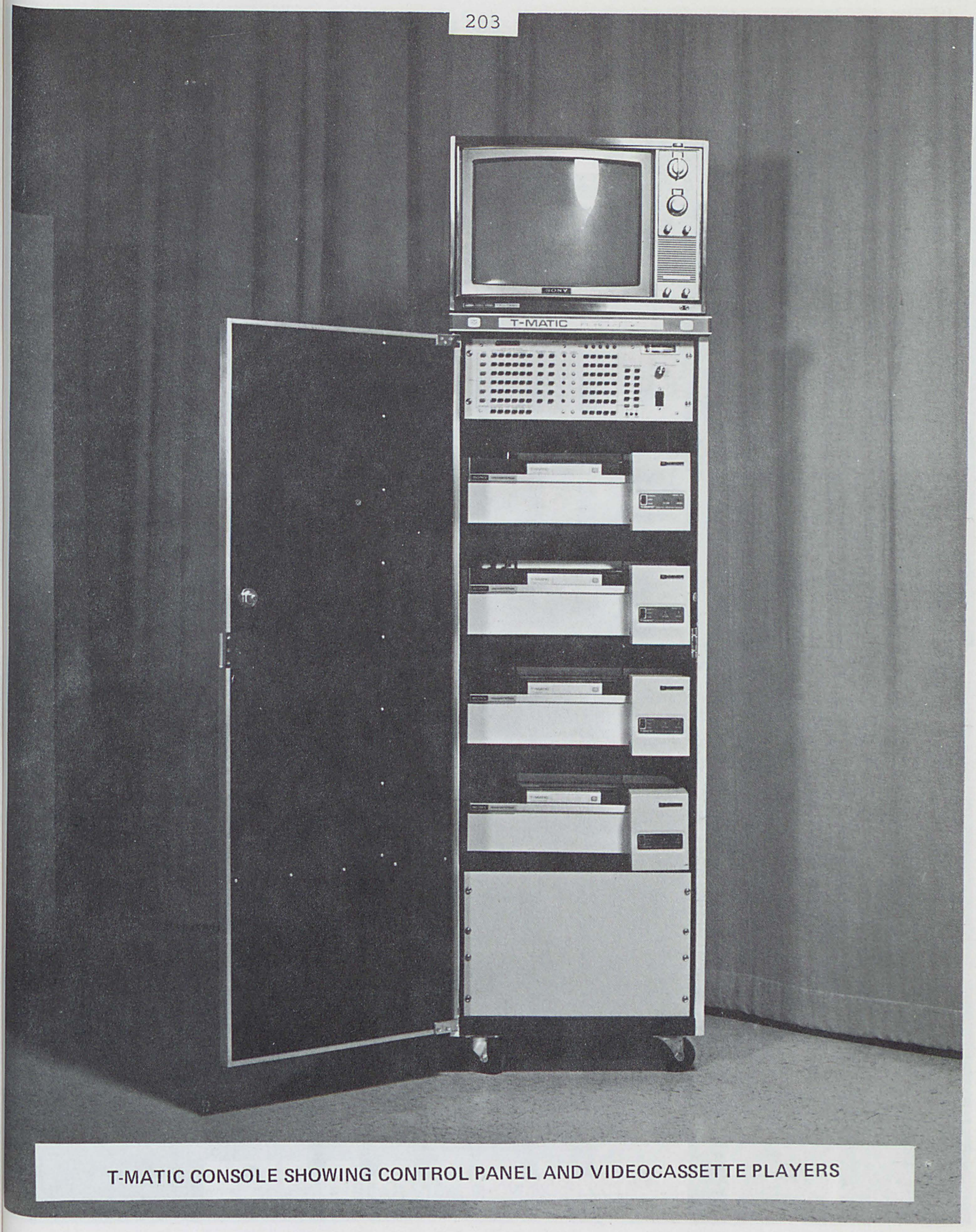
It can be integrated with film chains or open-reel recorders using the control signals from the automation system to start, pre-roll, and stop the recorders or projectors.

It can be used to program educational channels where the cable system, using their non-duplication programmer and T-MATIC system, can provide automatic pre-programmed unattended origination of educational fare as well as distribution to classrooms throughout the community.

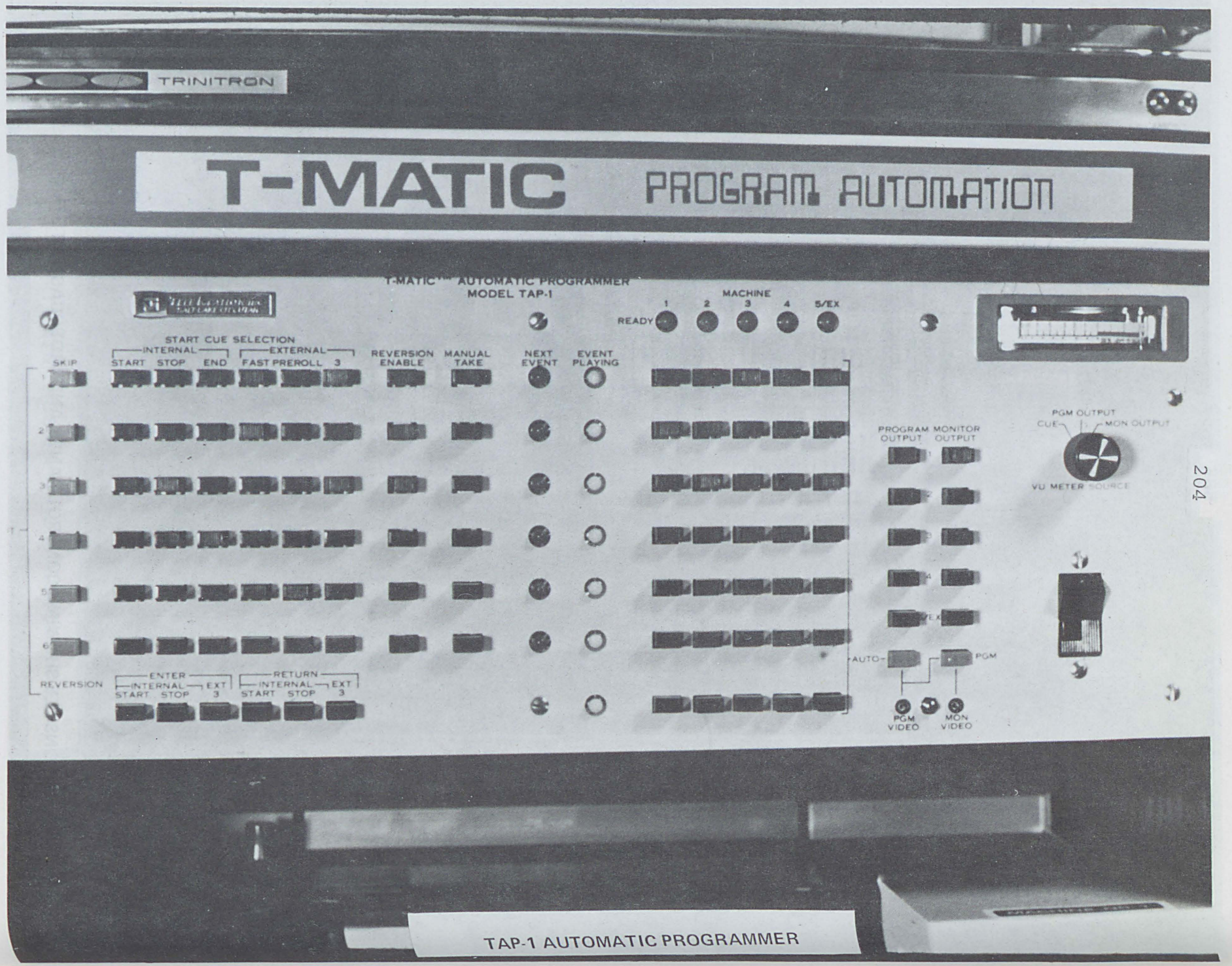
One final thought. The T-MATIC system, although composed of very simple logic elements, is rather complex taken as a whole. What this complexity of circuitry buys us is simplicity of operation to the point that we expect most T-MATIC consoles to be situated in the front offices of cable systems with programming accomplished by office girls.



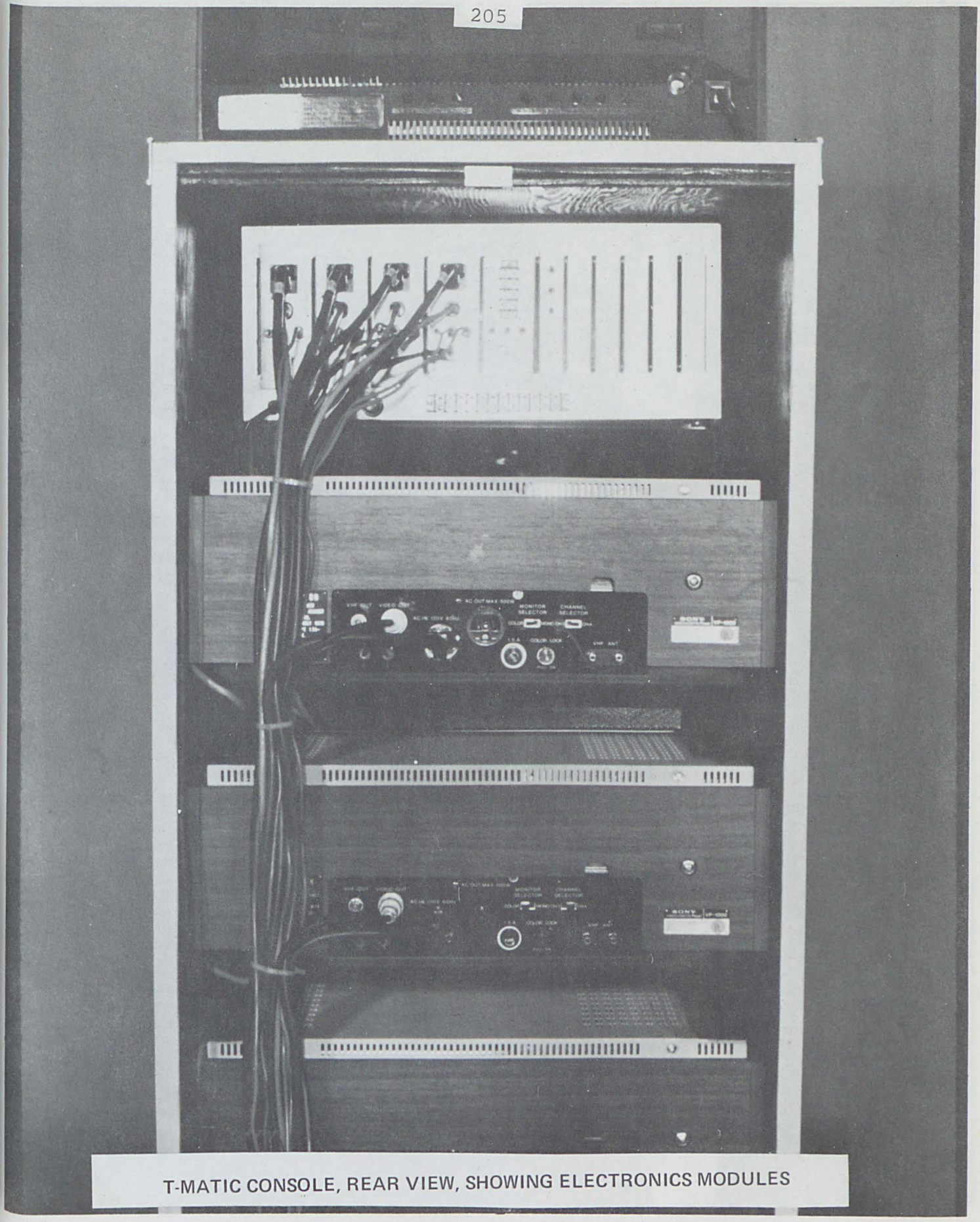
T-MATIC PROGRAM AUTOMATION CONSOLE



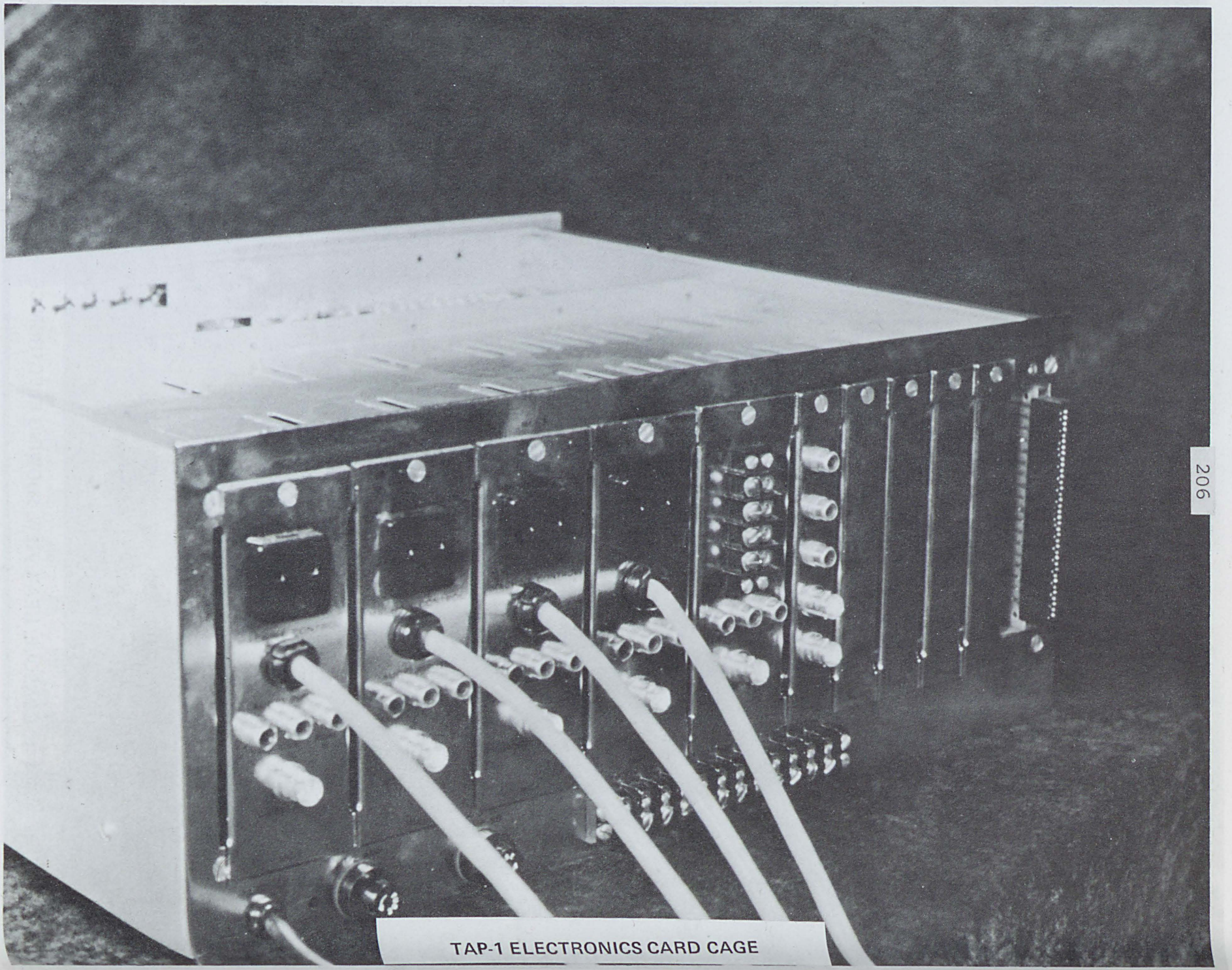
T-MATIC CONSOLE SHOWING CONTROL PANEL AND VIDEOCASSETTE PLAYERS



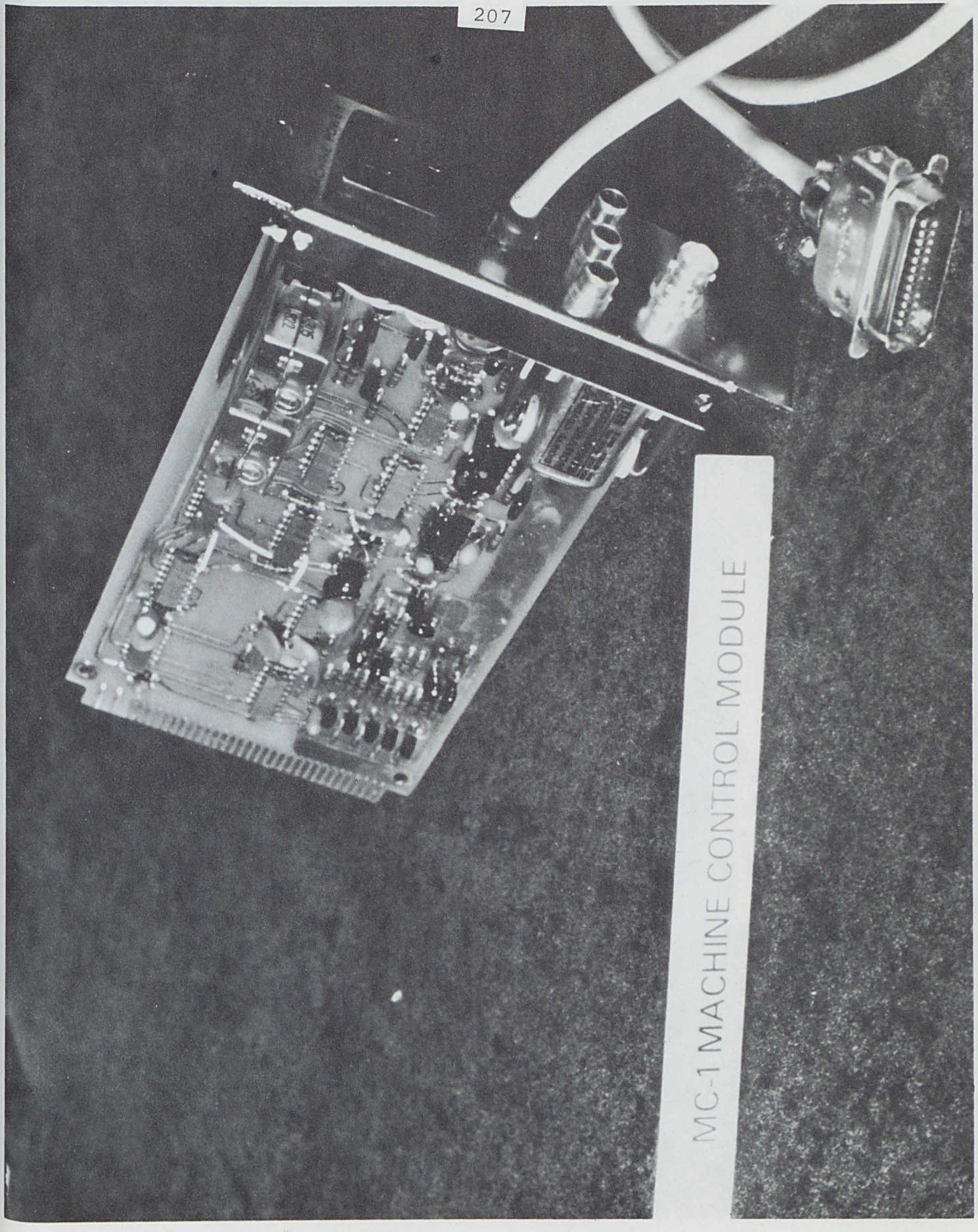
TAP-1 AUTOMATIC PROGRAMMER



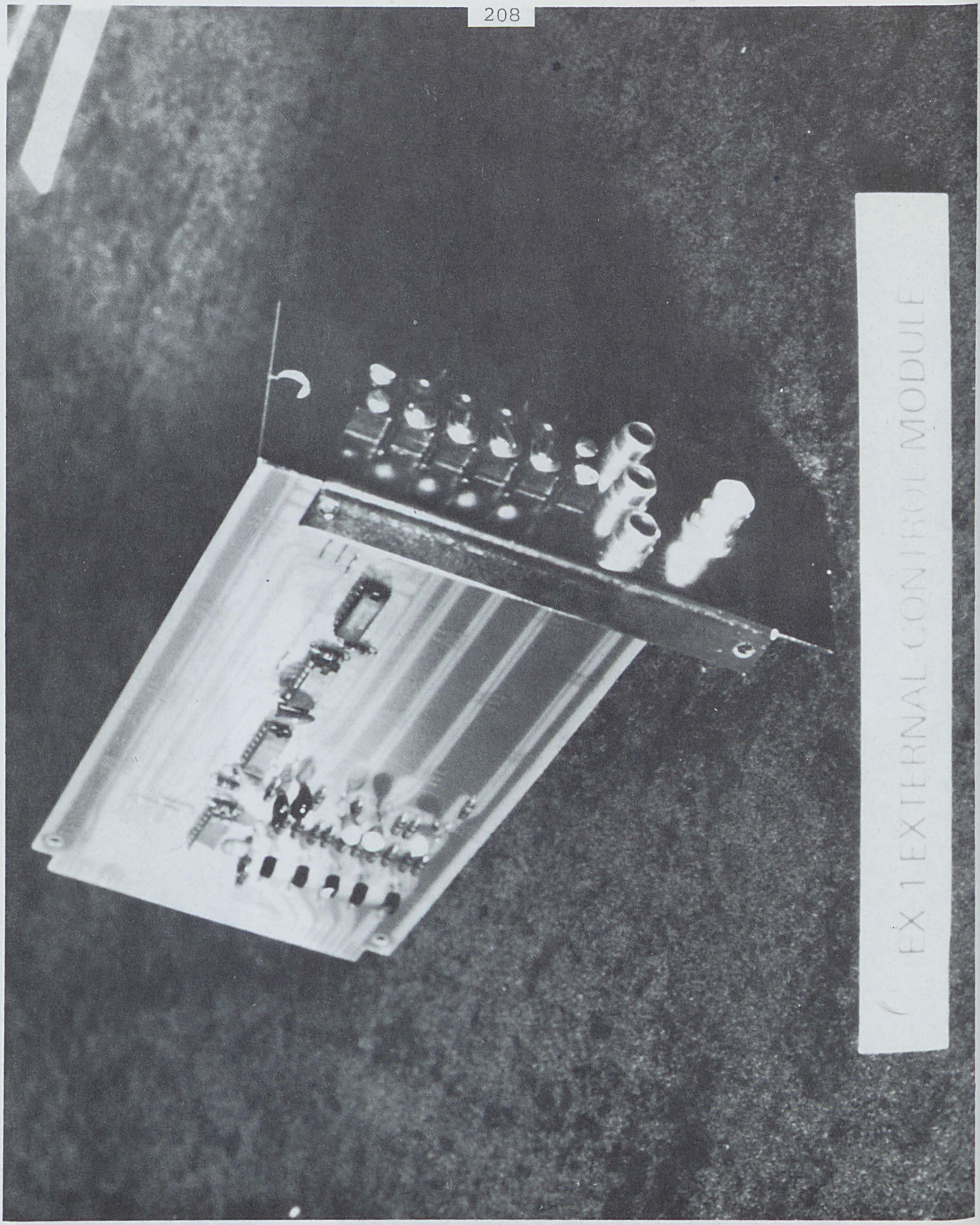
T-MATIC CONSOLE, REAR VIEW, SHOWING ELECTRONICS MODULES



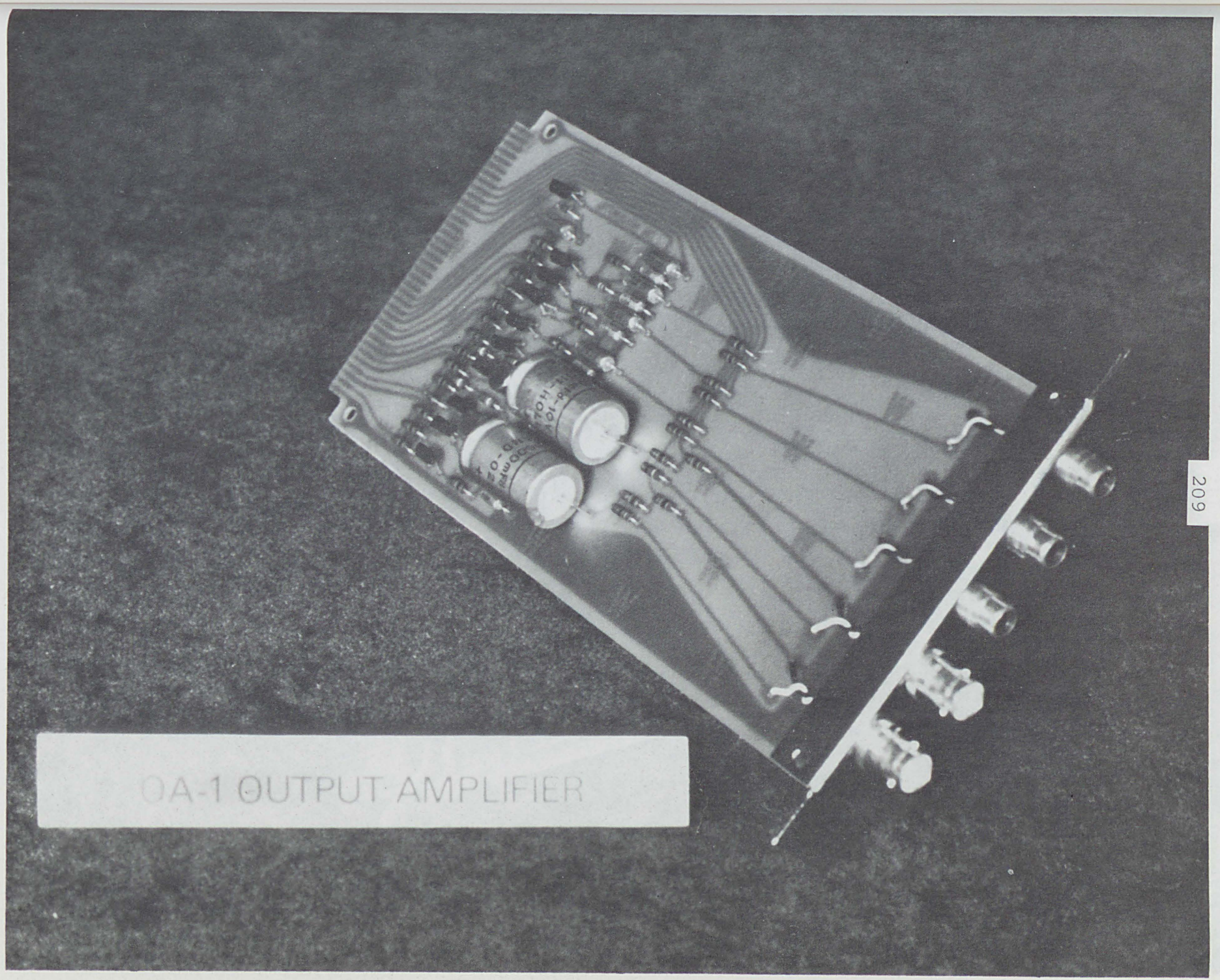
TAP-1 ELECTRONICS CARD CAGE



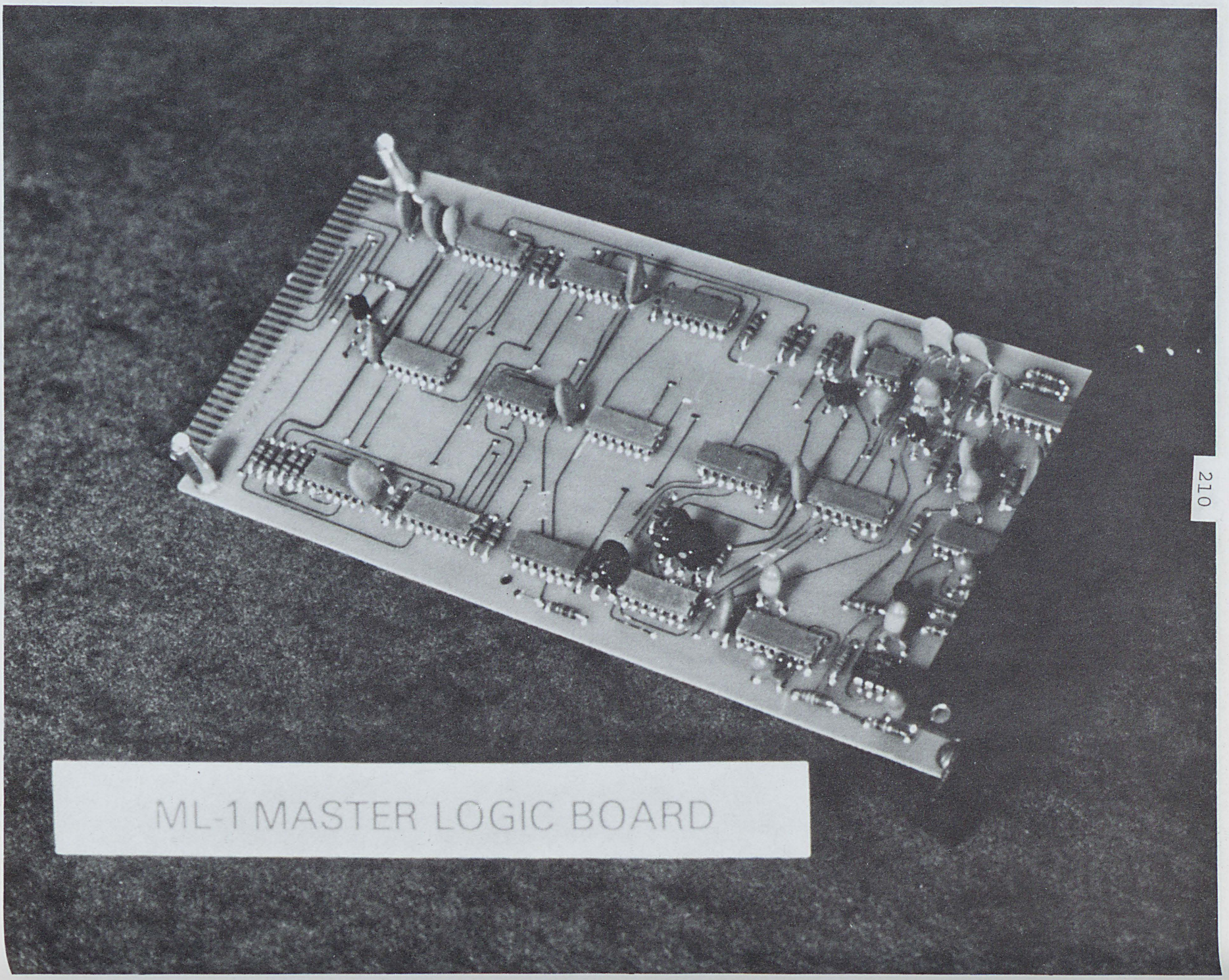
MC-1 MACHINE CONTROL MODULE



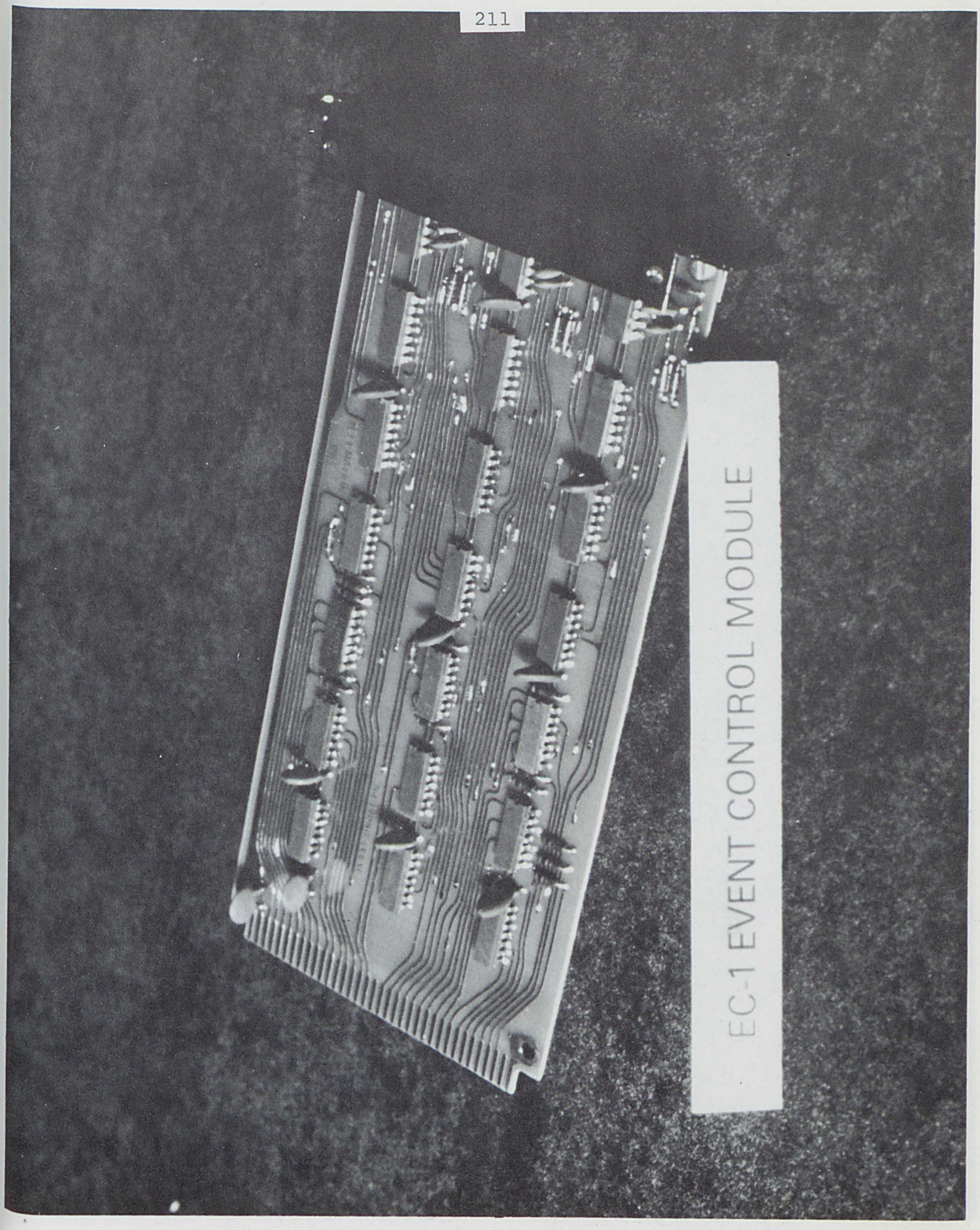
EX 1 EXTERNAL CONTROL MODULE



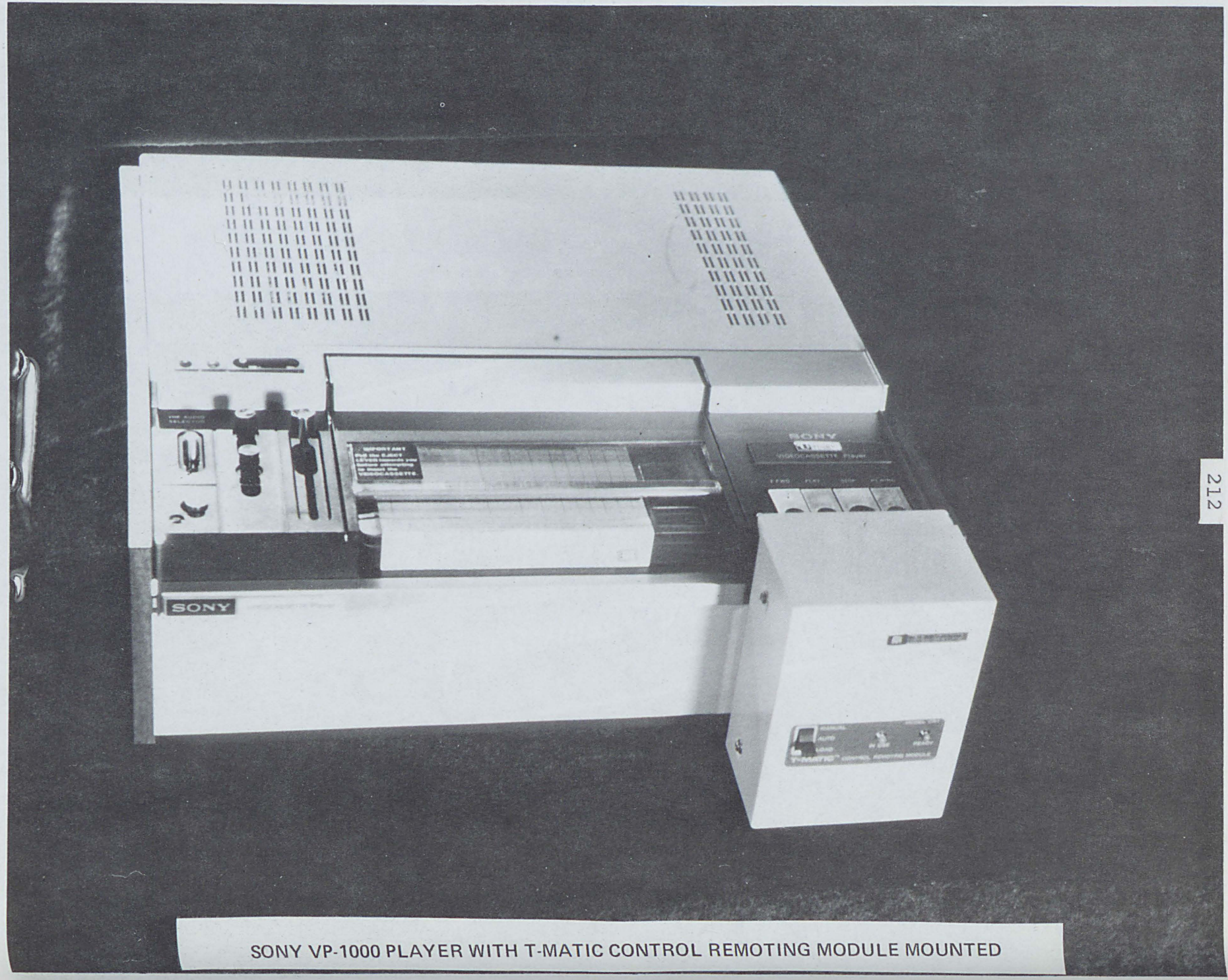
OA-1 OUTPUT AMPLIFIER



ML-1 MASTER LOGIC BOARD

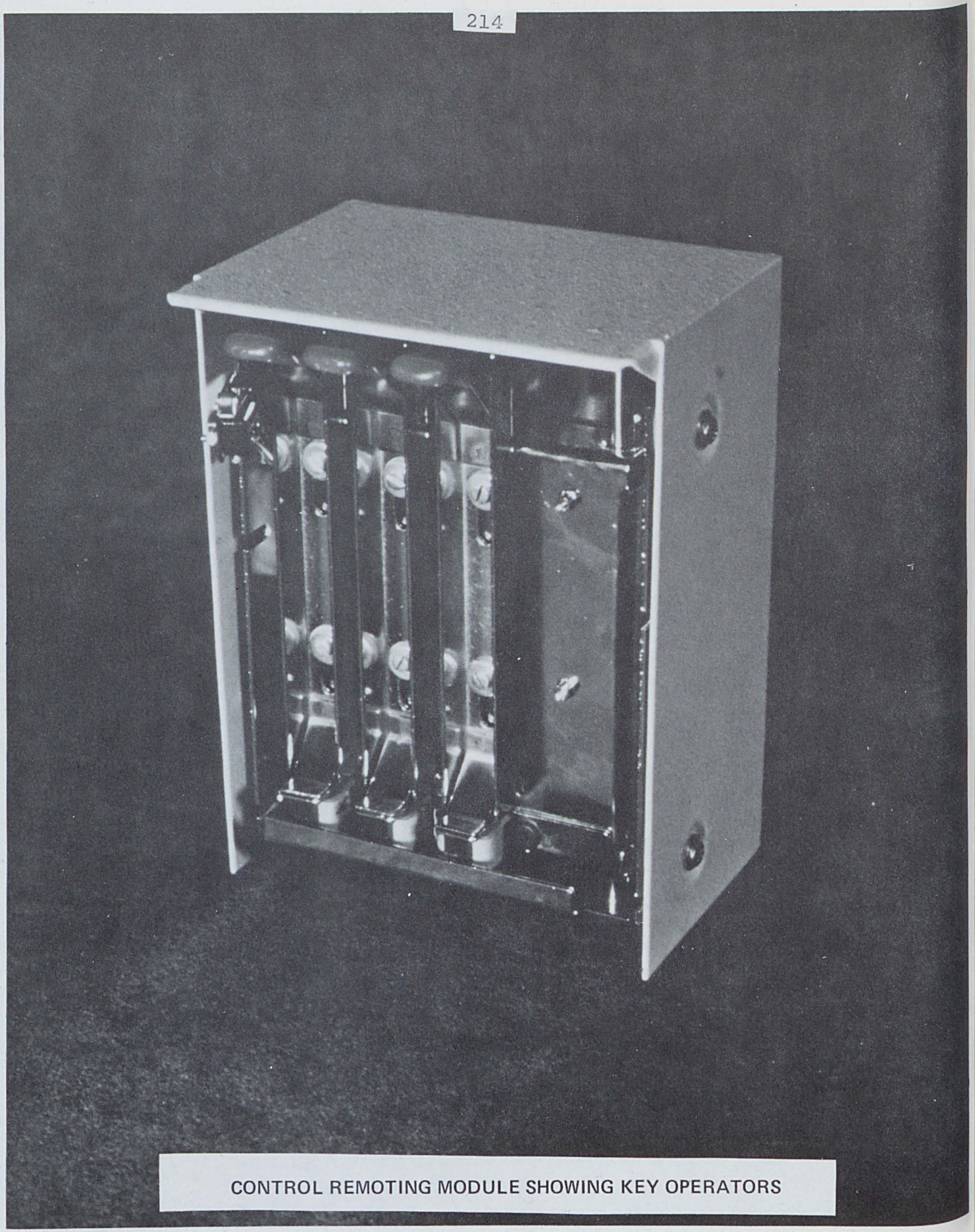


EC-1 EVENT CONTROL MODULE

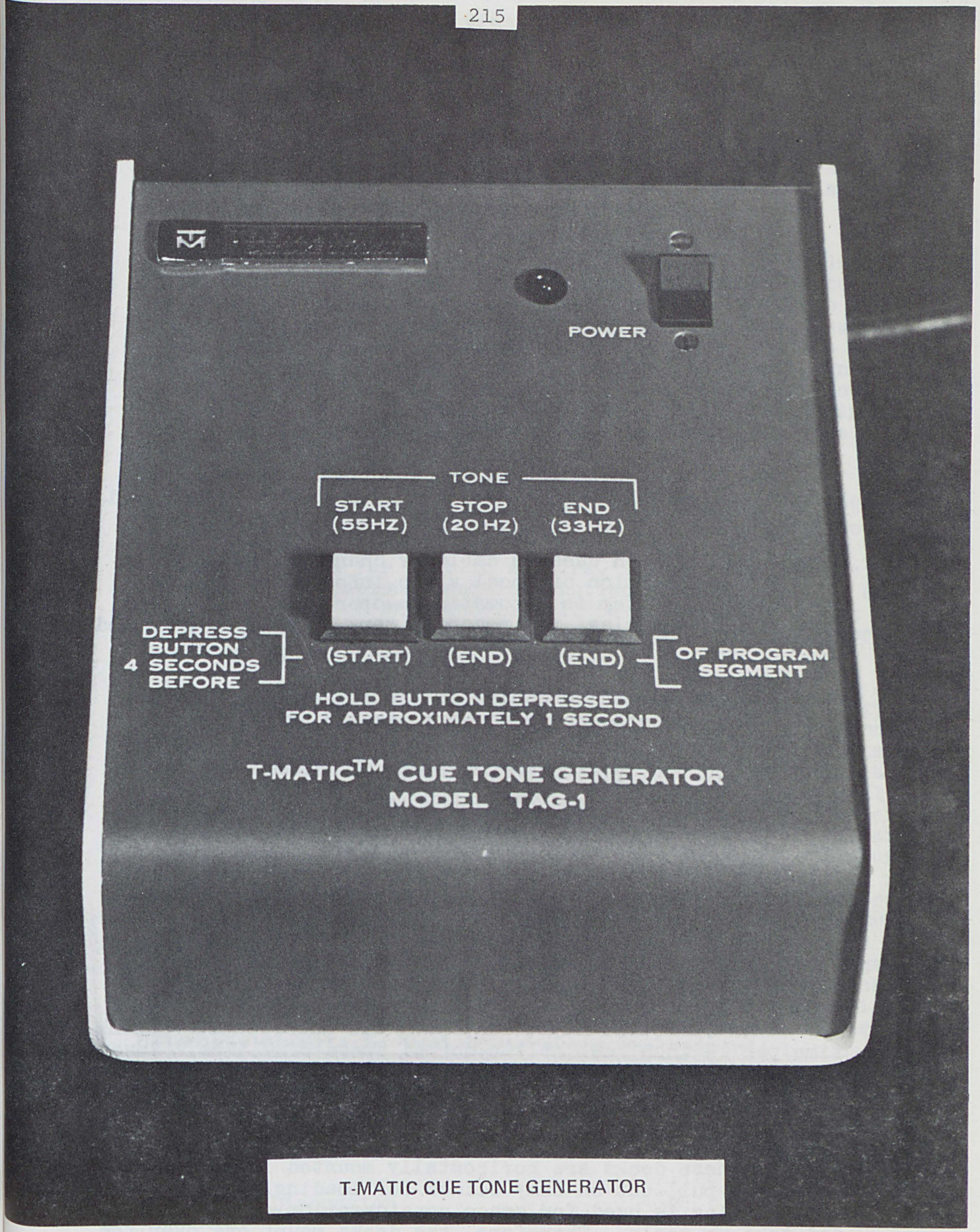


SONY VP-1000 PLAYER WITH T-MATIC CONTROL REMOTING MODULE MOUNTED

MOUNTED CONTROL REMOTING MODULE WITH COVER REMOVED



CONTROL REMOTING MODULE SHOWING KEY OPERATORS



T-MATIC CUE TONE GENERATOR