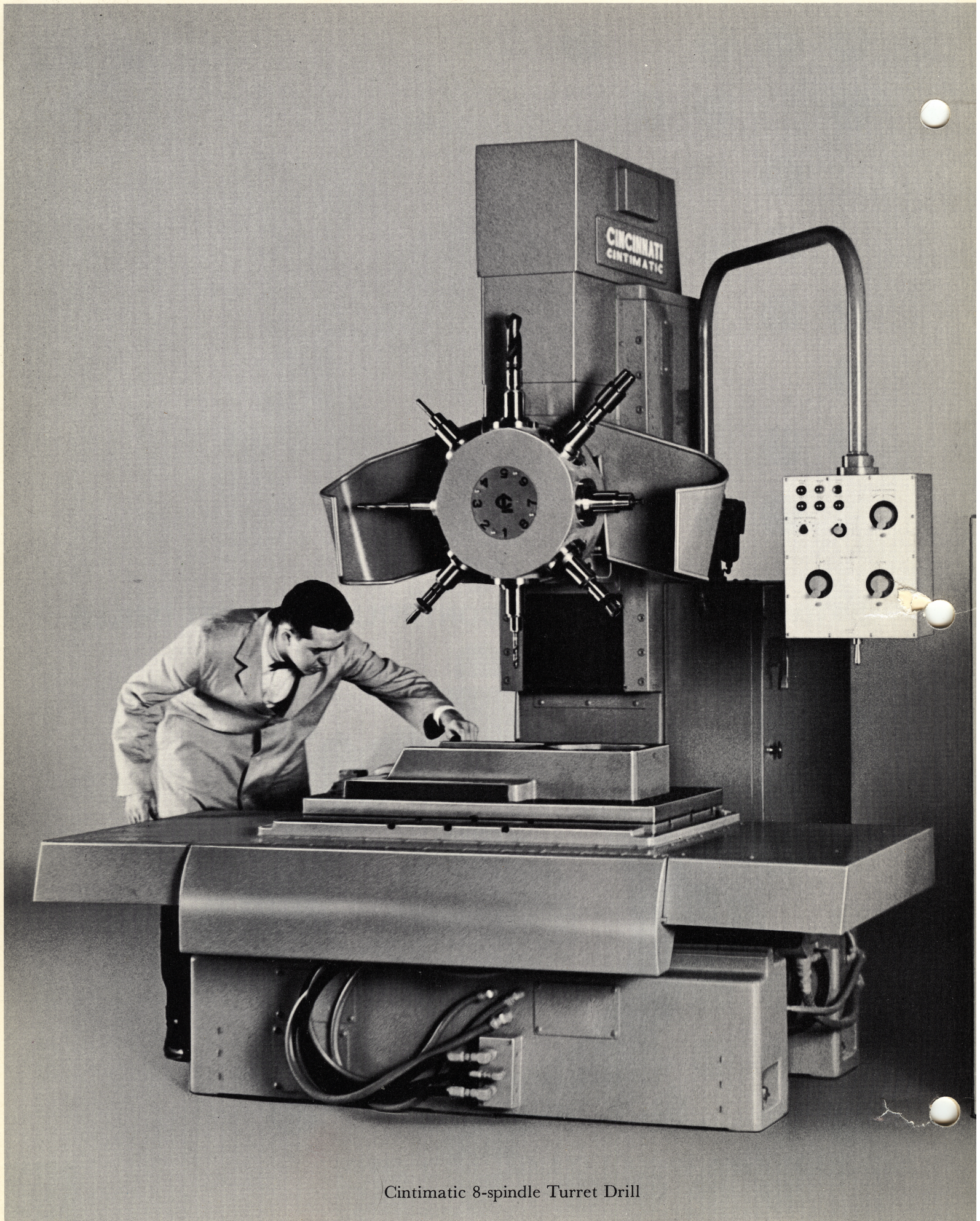
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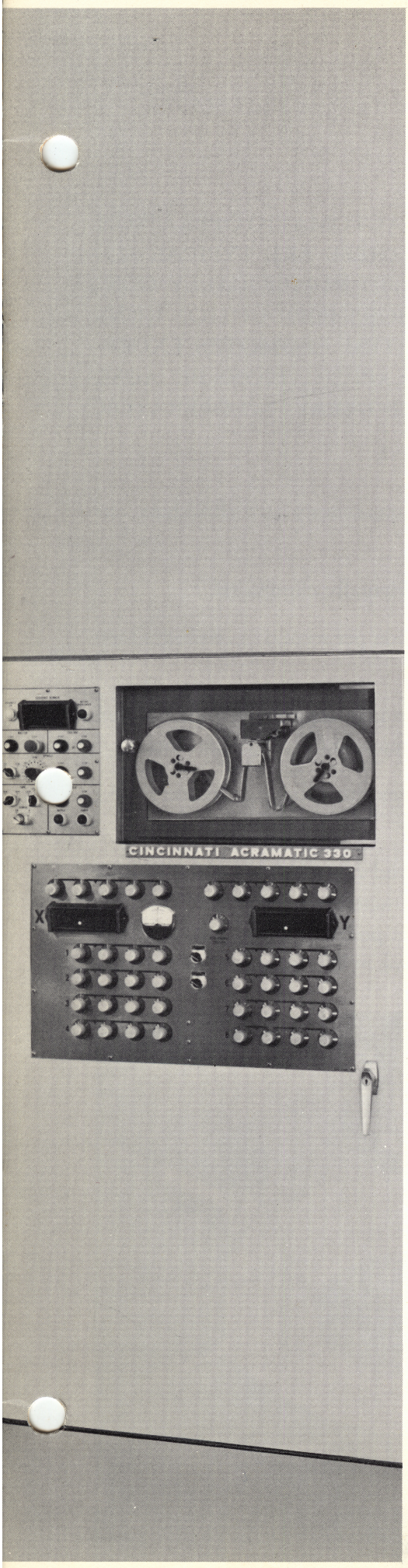
CINTIMATIC NUMERICALLY CONTROLLED TURRET DRILLS

CATALOG N-375-2

APRIL, 1967



Cintimatic 8-spindle Turret Drill



CINTIMATIC NUMERICALLY CONTROLLED TURRET DRILLS

spec's at a glance

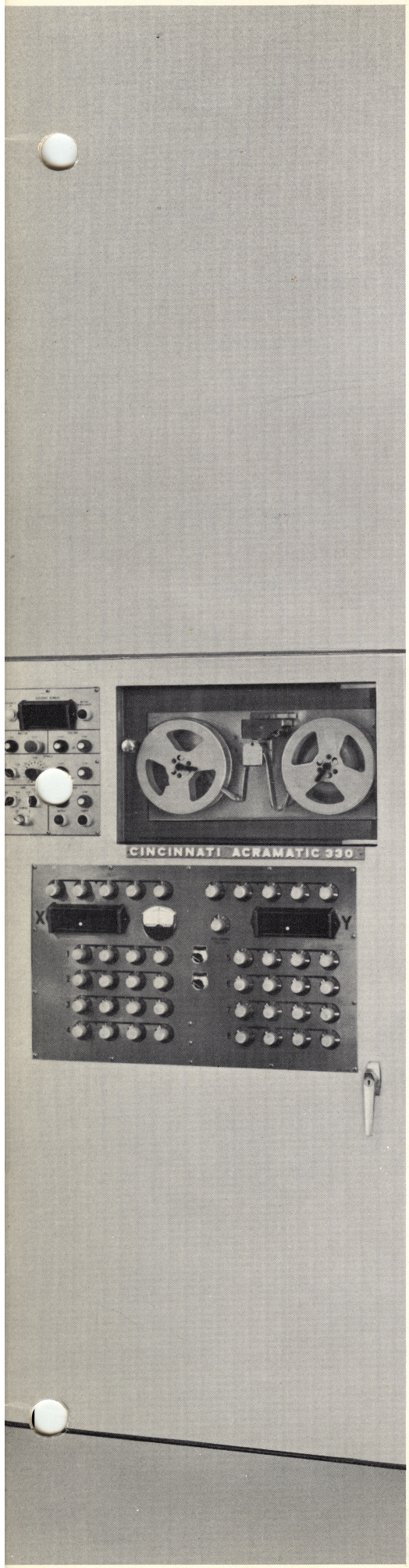
TABLE TRAVEL (HOLE PATTERN CAPACITY)...20 IN. x 40 IN.
DRILLING AND TAPPING CAPACITY (B-1112 STEEL)....1¼ IN.
SPINDLES.....6 or 8
HORSEPOWER.....5
SHIPPING WEIGHT (APPROXIMATE).....14,000 LBS.
NUMBER OF N.C. POSITIONING AXES.....3
NUMBER OF N.C. RATE CONTROLLED AXES.....3

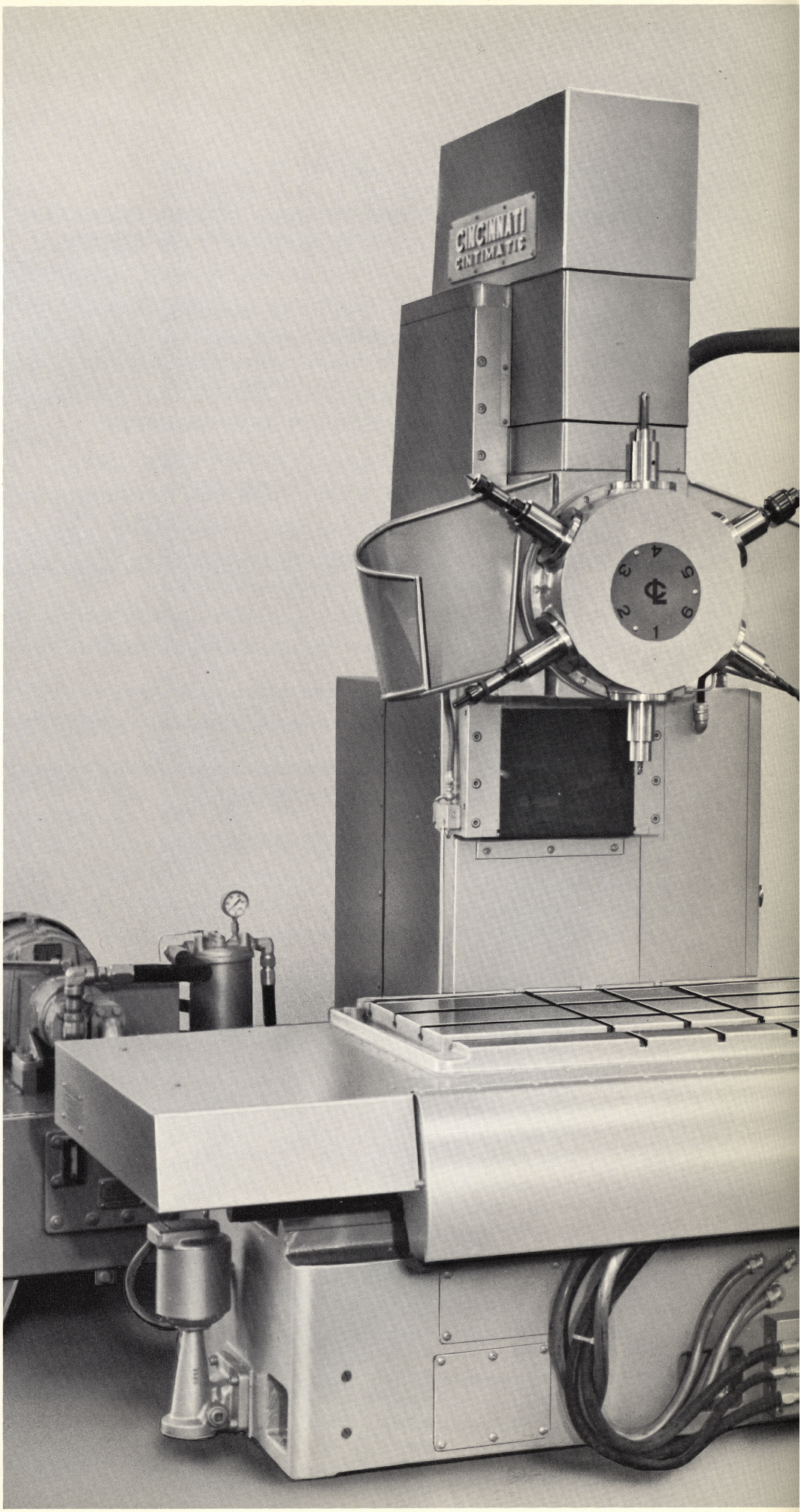
what it does

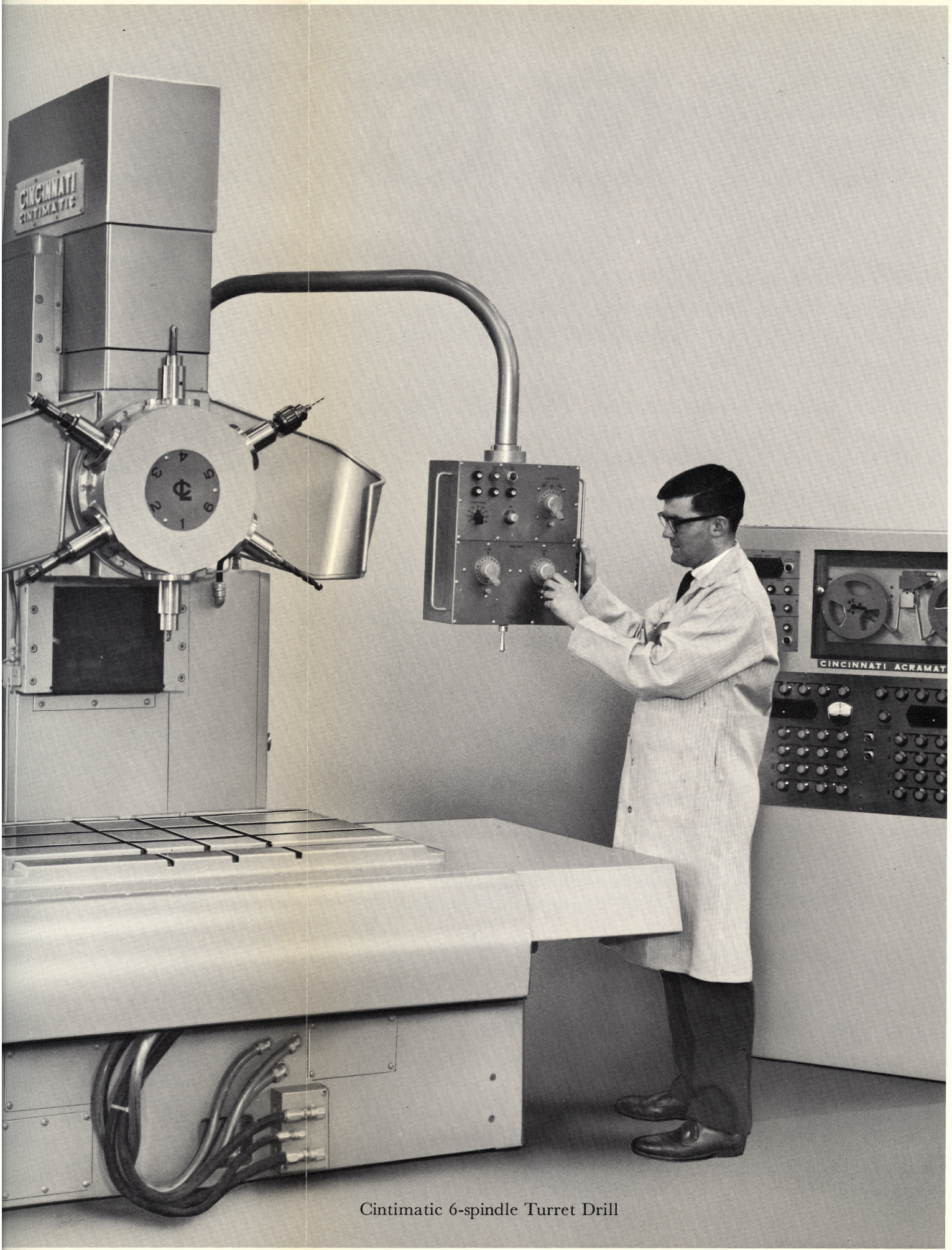
AUTOMATICALLY DRILLS, MILLS, TAPS, BORES AND CO-BORES WITH ALL FUNCTIONS SELECTED AND CONTROLLED BY TAPE. ONCE THE CYCLE HAS BEEN STARTED, THE ENTIRE SEQUENCE OF OPERATIONS IS COMPLETED WITHOUT FURTHER OPERATOR SUPERVISION.

economic benefits at a glance

- TOTAL PRODUCTION FLOOR-TO-FLOOR TIME IS CUT, OFTEN 50 PER CENT OR MORE.
- SET UP TIME IS REDUCED WITH PROGRAMMING TO ACTUAL DEPTHS (Z AXIS).
- ONE MAN CAN OPERATE TWO OR MORE MACHINES, SINCE NO OPERATOR ATTENTION IS REQUIRED DURING THE MACHINING CYCLE.
- SCRAP DUE TO OPERATOR ERROR IS VIRTUALLY ELIMINATED.
- SIMPLE, ECONOMICAL LOCATING AND CLAMPING DEVICES REPLACE EXPENSIVE JIGS AND FIXTURES.
- SMALL LOTS ARE MACHINED ECONOMICALLY, REDUCING INVENTORY COSTS.
- FULLY AUTOMATIC OPERATION PRODUCES *CONSISTENT*, FAST PRODUCTION RATES, WITH UNIFORM TOLERANCES.
- LEAD TIME REQUIRED FOR NEW PARTS, OR TO MODIFY EXISTING PARTS, IS SHARPLY REDUCED.


CINCINNATI ACRAMATIC 330
X
Y


CINCINNATI
SINTIMATIC

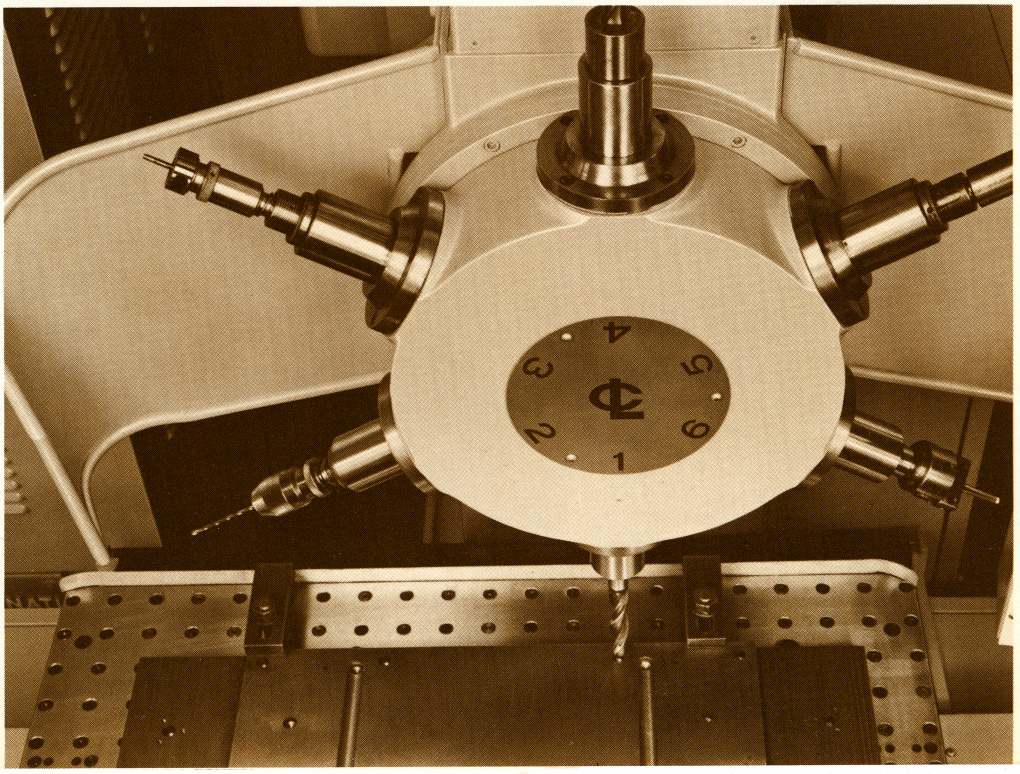


Cintimatic 6-spindle Turret Drill

provides speed and efficiency for short production runs or small job lots

FAST SET UP . . . SIMPLE FIXTURING . . . AUTOMATIC OPERATION WITH COMPLETE TAPE CONTROL . . . THESE ARE TYPICAL ADVANTAGES THAT MAKE THE CINTIMATIC NUMERICALLY CONTROLLED TURRET DRILL IDEAL FOR SHORT PRODUCTION RUNS OR SMALL JOB LOTS. THIS 3-AXES SYSTEM PROMOTES EXCEPTIONALLY HIGH EFFICIENCY IN THESE APPLICATIONS BECAUSE THERE'S NO WASTE MOTION, NO CYCLE DELAY, NO OPERATOR CONFUSION. FOR EXAMPLE . . .

- Both X and Y axes table movements travel simultaneously at a consistent, extremely high speed . . . 200 IPM.
- With the full servo system, table settling time is virtually eliminated.
- High speed tape reader enters 60 lines of information per second . . . includes tape advance, rewind, and search abilities.
- Since spindle feeds and speeds are coded on the tape separately from the tool number, optimum rates can be used for each diameter of combination tools.
- Tool selection may be made in any sequence. Index time from one station to any other is virtually identical.
- Production is sped by reducing turret advance and retract time. When drilling successive holes with the same tool, the tool is retracted only enough to clear the workpiece . . . it doesn't return to the upper index position. When this same tool is used at various work levels, it advances each time at the rapid rate to the work



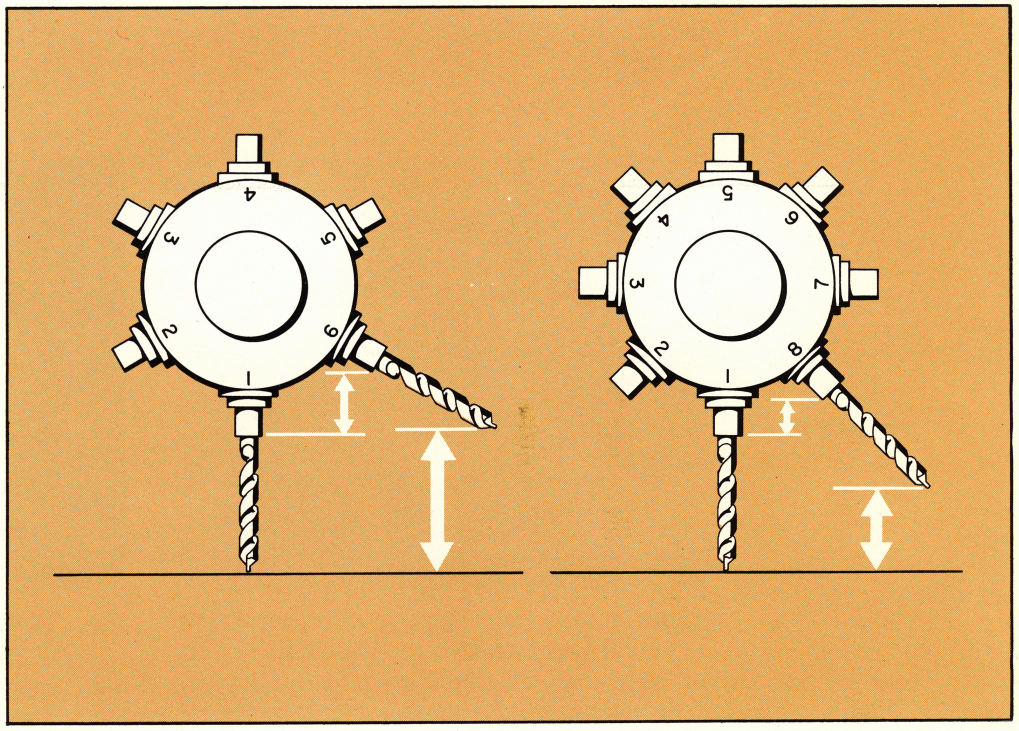
surface, thus there's no "cutting air" from the uppermost level to the work surface, where the slow machining feed rate begins. When another tool is called for, the head rapids to the upper limit index position, indexes, then rapids back down to a point just above the workpiece.

- Response to commands is almost instantaneous. The Cintimatic cuts metal an extremely high percentage of the time.
- Programmed work surface compensation speeds production of work having different heights from the work table. The programmer may compensate for this difference and rapid traverse the tool to within a fractional distance of all work heights. This may also be employed for "woodpecker" drilling.

There are many more features of the Cintimatic Numerically Controlled Turret Drill. Read about them on the following pages.

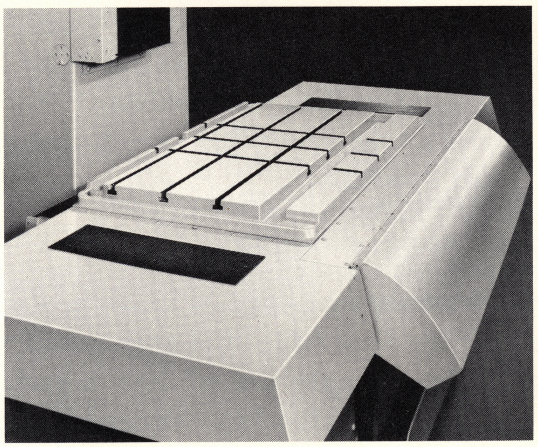
which model should you choose?

The Cintimatics are available in six or eight-spindle models. When your programs call for a large number of tool operations your choice will be the eight-spindle model since it provides for increased tool capacity. But for greater tool clearance, particularly important in deep hole machining, the Cintimatic six-spindle turret drill with 60 degree separation of spindles provides tool selection with less work-tool interference. The sketch below illustrates the tool clearance differential between six and eight-spindle machines.



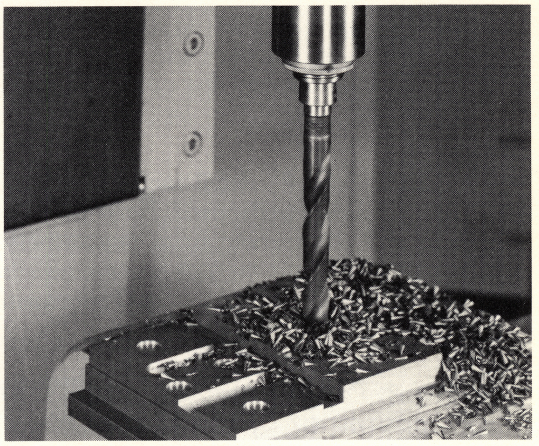
modern cintimatic machining by tape command

The Cintimatic Numerically Controlled Turret Drill is truly a tape controlled machine . . . designed from the ground up to handle *all* functions by tape command, with high efficiency and continuing accuracy.



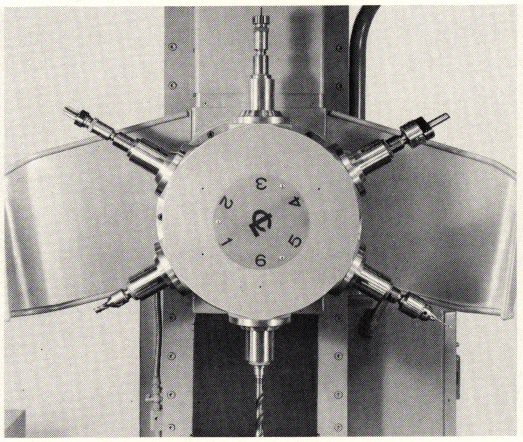
TAPE CONTROLLED WORK TABLE FEATURES SPEED, ACCURACY, HIGH CAPACITY. The two-axis work table is positioned automatically and accurately under the spindle by tape command . . . both axes traveling simultaneously at a consistent, extremely high speed . . . 200 inches per minute. No time is lost when the table reaches the final position since settling time is virtually eliminated. Positioning accuracy is ±.001″ in 24″, with ±.0005″ repeatability full range.

The massive work table can handle an exceptionally large workpiece or several smaller pieces at one set up. Work load capacity is 1500 lbs. Travel of the Y axis is 20 in., the X axis is 40 in. Three precision combination T and tongue slots are provided parallel to both the X and Y axes for mounting fixtures to the table.

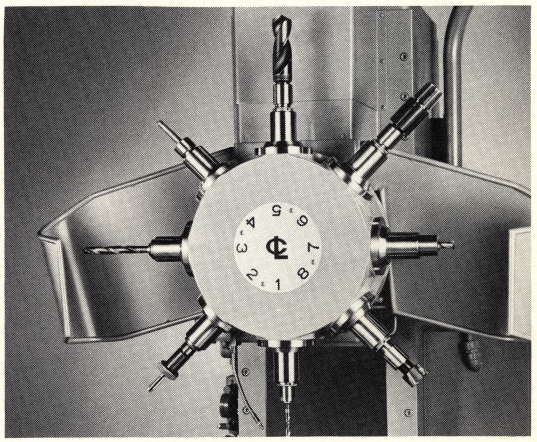


TAPE CONTROLS HOLE DEPTH . . . NO NEED FOR MANUALLY CONTROLLED PRESET DEPTH STOPS. With hole depth automatically controlled by tape commands, there are no manual depth stops to be preset. Thus, a single tool will drill a variety of depths during the machining cycle without manual adjustment. This is a full three-axes system with continuous numerical control of the Z axis position and rate of motion.

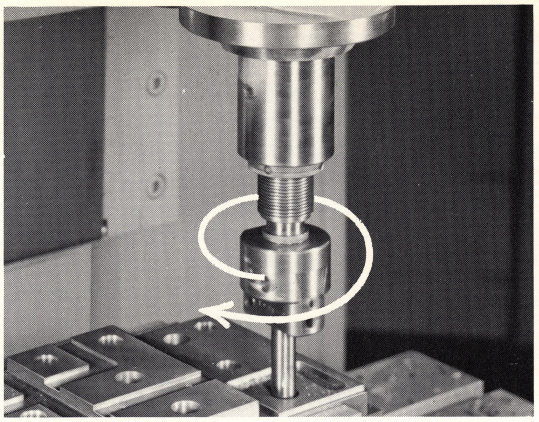
The Cintimatic Turret Drill is equipped with a tool length compensator which requires only the programming of hole depth. If a 4-in. depth is desired, for example, 4.000 in. is programmed. Rapid advance and tool retract are not programmed. In addition, the tool length compensator eliminates the need for presetting of tools, and the same tool can be programmed to any number of depths.



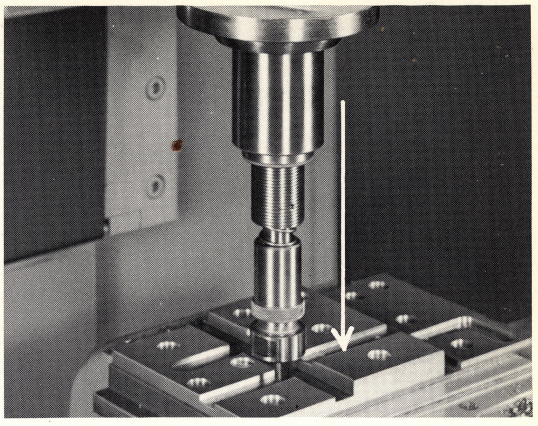
TURRET INDEXING IS FAST AND ACCURATE . . . BY TAPE COMMAND. Any one of the six or eight tools may be selected at random by tape commands. Positioning speed is fast, requiring a maximum of six seconds to change



from one tool to another. CURVIC couplings assure accuracy, rigidity and long life. Power is delivered only to the tool that is selected, the others remaining idle.

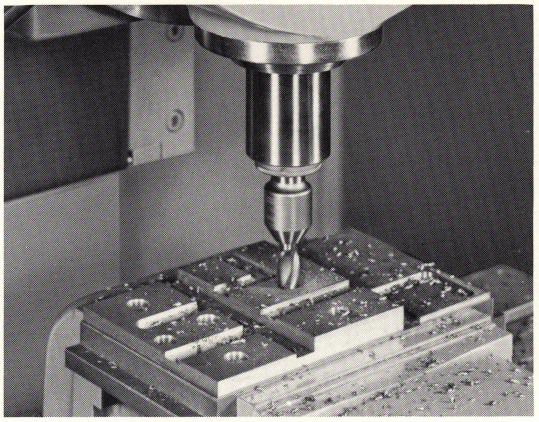


TAPE CONTROLS SPEED SELECTION FOR ALL SPINDLES. 16 spindle speeds, covering a range from 70 to 2120 RPM, are provided to all spindles through a constant-mesh geared transmission and hydraulic clutches. Since all speeds are selected by tape commands, combination tools are used to their fullest capacity. Further, the ability to use any spindle for any speed simplifies programming.

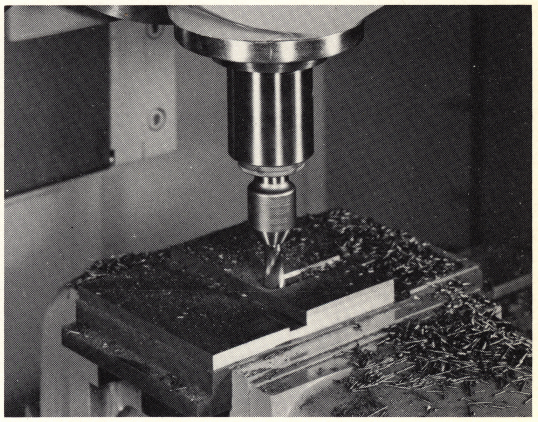


TAPE SELECTS A WIDE RANGE OF FEED RATES. A total of 185 useful feed rates (Z axis) ranging from ½ to 99 IPM are selected by tape commands. From ½ to 10 IPM feeds are selected in .100 IPM increments, 10 to 99 are in 1″ increments.

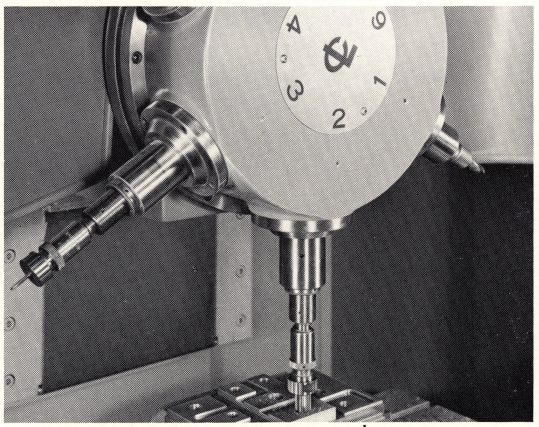
Rapid traverse is automatically initiated and stopped just above the work and need not be programmed.



TAPE CONTROLS SPINDLE DWELL ON ALL SIX OR EIGHT SPINDLES. Spindle dwell for precision co-boring and spot-facing operations is provided for each spindle. Upon command from the tape, the spindle will dwell for a preset time when programmed depth is reached.



INFINITELY VARIABLE MILLING FEEDS . . . SELECTED BY TAPE COMMAND. Light milling may be performed on the Cintimatic Turret Drill. Infinitely variable milling feeds, from 2 to 99 IPM are provided for the table. Milling feed is selected by tape command. Manual override of the feed rate is provided on the pendant station.



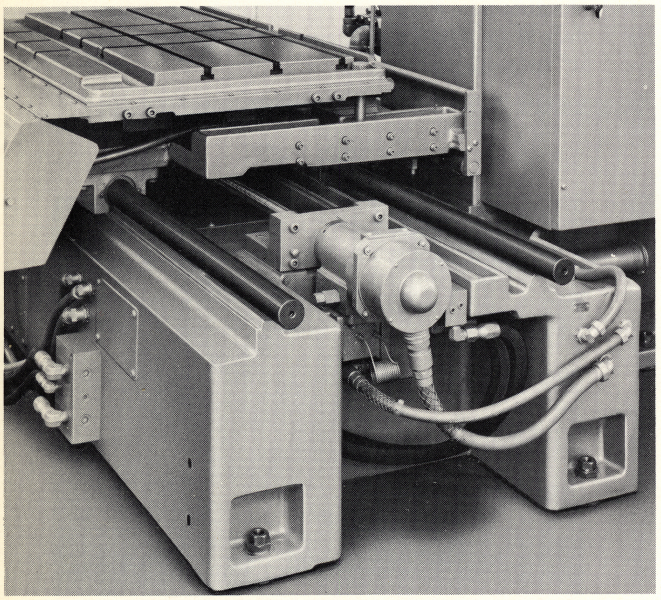
TAPE COMMANDS CONTROL TAPPING CYCLES . . . ON ALL SIX OR EIGHT SPINDLES. All spindles may be used for tapping. Taped command controls depth and direction of thread, feed in, spindle reverse, feed out.

BORING CYCLE UTILIZES ALL FEED RATES . . . BY TAPE COMMAND. The boring cycle utilizes all available feed rates. In boring, the tool feeds in and feeds out at the same rate.

MANUAL CONTROLS INCREASE VERSATILITY. Manual controls are provided to assist in set up or to drill holes which have not been programmed on tape. X and Y coordinates can be preset on decade switches. Spindle speeds can be entered in the console. The spindle is fed by a handwheel, graduated to indicate hole depth, which is mounted on the pendant station.

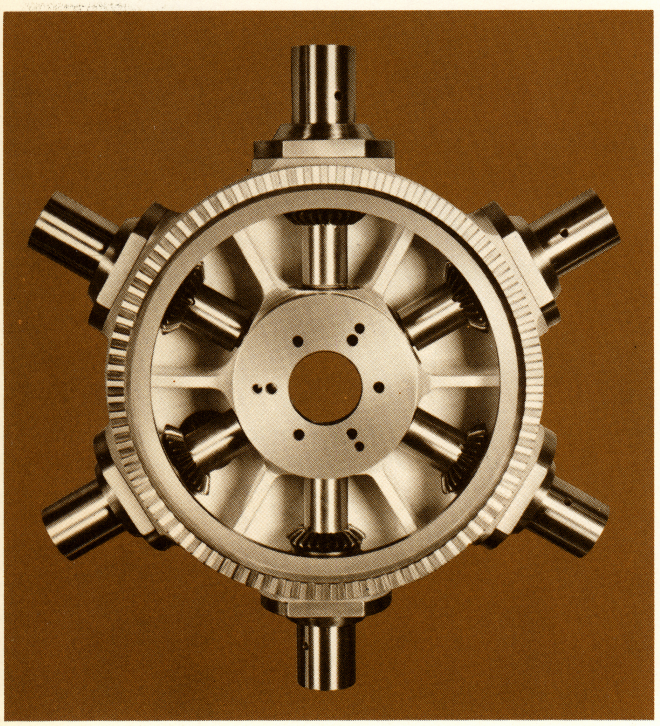
cintimatic provides built-in accuracy

Maximum production, and other benefits of numerical control require a high degree of machine accuracy. The Cintimatic Turret Drill provides it . . . initially and throughout the long life of the drill. Massive, rugged castings . . . positive, reliable controls and zero-backlash drive trains . . . these and other construction highlights assure you of accurate Cintimatic production, job after job.



MASSIVE WORK TABLE CONSTRUCTION PROMOTES ACCURACY. The massive work table is given rigid support by the huge cast iron, T-shaped fixed bed base which weighs approximately 6,000 pounds. The base extends under the entire length of X axis travel, meaning there is no overhang. Way construction of both axes utilizes 2″ diameter hardened and ground steel rods with recirculating caged ball bearings, providing a full anti-friction carrier free of slip-stick action. As a result, the table may be moved in increments as small as .001″ .

Low inertia, hydraulic servo motors power the table by driving low friction, anti-backlash, ball bearing lead screws . . . contributing further to the accuracy of the Cintimatic Turret Drill. The hydraulic motors are always controlled by electro-hydraulic servo valves. When it reaches the proper position, the table is held by the full thrust (over one ton) of the electro-hydraulic servo system . . . table clamping is eliminated. Accuracy of the position is maintained continuously by sensitive absolute feedback units. Three precision combination T and tongue slots are provided on both the X and Y axes for mounting fixtures to the table. Large steel guards protect the ways and screws from chips and coolant.

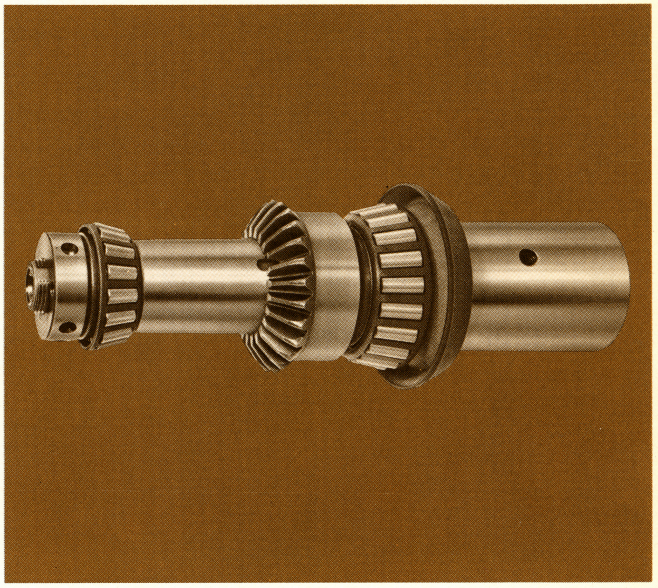


CURVIC COUPLING . . . OTHER FEATURES . . . ASSURE TURRET ACCURACY. Turret and turret carrier construction are designed to promote accuracy. For example, the turret is connected to its carrier through a CURVIC coupling ring having mating teeth spaced around its entire perimeter. When the teeth are engaged, they form a highly accurate, self-centering connection which is virtually free of wear, prevents backlash, and provides maximum support for the turret. To index the turret, a two-direction hydraulic turret clamp piston moves outward to disengage the CURVIC coupling. Thereupon, the hydraulic indexing pistons are actuated, moving the turret to the selected position through a drive train comprised of two racks and an indexing pinion. Then the turret clamp piston retracts to re-mate the coupling and hold the turret hydraulically.

Maximum spindle rigidity and alignment accuracy are achieved by using the turret carrier for feeding. The carrier travels on wide, adjustable anti-friction bearings which take both the drill thrust and carrier weight. In turn, the bearings ride on hardened and ground replaceable ways mounted on the massive, cast iron column.

Turret carrier feed in the Cintimatic Turret Drill is powered by a low-inertia hydraulic motor driving an anti-backlash ball bearing lead screw. The motor is always controlled by an electro-hydraulic servo system, and depth is measured by an absolute feedback unit directly coupled to the Z axis ball screw.

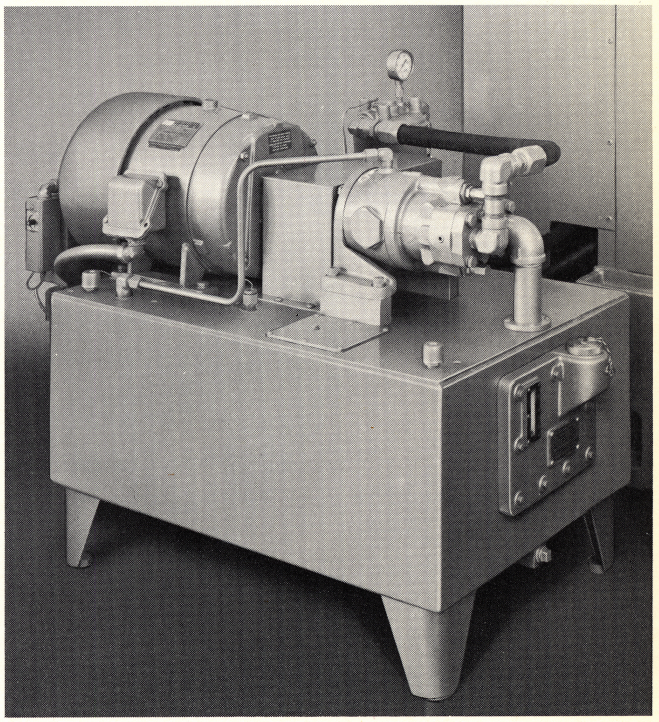
ADVANCED SPINDLE DRIVE TRAIN PERMITS USING ALL SPEEDS ON ALL SPINDLES. Spindles are driven by a two-speed 5/2.5 HP motor through a drive train which permits using all speeds on all spindles, with power delivered only to the spindle in actual use, the other spindles remaining idle. The drive train consists of an 8-speed constant mesh transmission which delivers power from the motor to a splined shaft through hydraulically actuated clutches. The splined shaft is connected to the spindle drive shaft through heat-treated matched beveled gears, and the spindle is similarly connected to the spindle shaft.



Spindles, spindle drive shaft, and the splined shaft are all mounted on double-row tapered roller bearings. The gearing and bearings are effectively lubricated by an oil mist system.

Spindles are made of high quality alloy steel, heat-treated and precision ground. A wide choice of spindles is available at no extra cost (see table on page 18). Spindle bearings can be adjusted merely by removing the turret cap, thus exposing the adjusting nut . . . there's no need to remove the turret.

HYDRAULIC SYSTEM PROVIDES SENSITIVE CONTROL . . . RELIABILITY. Muscle for the Cintimatic Turret Drill is provided by a sensitive and versatile hydraulic system. The hydraulic motors which drive each machine motion . . . and the sensitive electro-hydraulic servo valves which control the motors . . . were specifically designed, developed and built by Cincinnati for machine tool applications. They assure rugged, trouble-free performance under machine shop conditions.



Hydraulic power is supplied by a pump-and-tank unit which is separated from the machine, thereby keeping heat from the machine. The variable delivery pump supplies oil only upon demand, avoiding needless heating of the oil. A heat exchanger is used to control oil temperatures.

solid state acramatic control assures reliability . . . easy maintenance

The Cintimatic Turret Drill uses the Cincinnati Acramatic 330 Numerical Control Unit. It employs absolute measurement for both input and feedback. This system never gets "lost." It is not necessary to refind or reestablish zero every time power has been shut off.

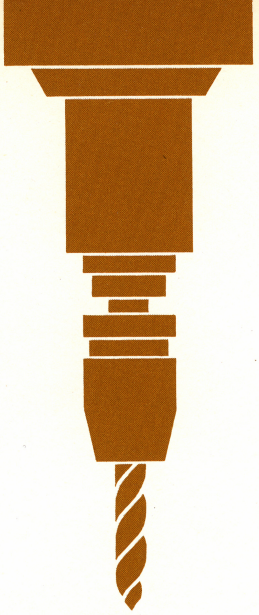
The control is a solid state type featuring modular construction with printed circuit boards and wire-wrapped chassis. All logic functions are handled by transistors, toroids, and other solid state components. Power supply is also solid state. Manual position dial-in, tape reader, cycle control, position and sequence display...all are grouped on the control panel for operator convenience. Full range zero shift is located on the pendant control.

Maintenance cares are minimized with the Acramatic, too, especially with the aid of diagnostic test tapes, built-in test circuits and standard no-extra-charge maintenance kit which enables regular electrical maintenance personnel to perform routine maintenance. With an optional spare parts kit...plus the maintenance kit ...any size shop can properly service its own control equipment.

As standard equipment, the console has take-up reels capable of handling long tapes. The reader, which reads at a rate of 60 lines per second, also provides automatic advance or rewind. The automatic advance feature can be programmed for loop tapes. When the last block of information is reached, the tape will automatically advance to the start position. With a reel-mounted tape, however, the last block may be programmed to cause the reader to rewind back to the start position . . . re-threading is not required. The operator may also manually cycle the reader so that it will search out the nearest last full block of information . . . further speeding up operations.

The console unit will accept code deletes, an important aid to tape preparation, producing outstanding time savings. Full range zero shift is included on the pendant station as standard equipment. Available optionally are axis inversion (mirror image, for production of left and right hand parts or segments of bolt hole circles from one zero setting), dual point zero shift (zero on-off switch to provide two zero points for multiple setups), and additional miscellaneous functions. An air conditioner for the console is standard equipment. For additional information on the Acramatic Control, please see Catalog M-2438-1.


CINCINNATI ACRAMATIC 330
X
Y



SEQ. NO.	PREP. FUNCT.	X POSITION	Y POSITION	Z FEED POSITION	Z FEED	Z RAPID POSITION	SPINDLE SPEED	TOOL FUNCT.	MISC. FUNCT.
H 001	G 81	X 05000	Y 10000	Z 0625	F 510	R 0000	S 721	T 4	M 13

FIG. 1—SECTION OF PROGRAM SHEET

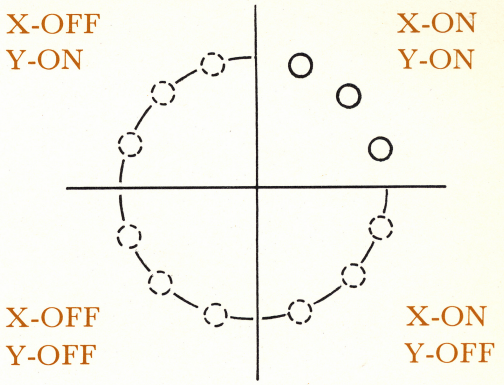
cintimatic programming is fast and easy, too

At Cincinnati, experienced programmers and engineers cooperated in developing a programming system for the Cintimatic Numerically Controlled Turret Drill which is exceptionally fast and simple, using methods familiar to tool designers and shop personnel.

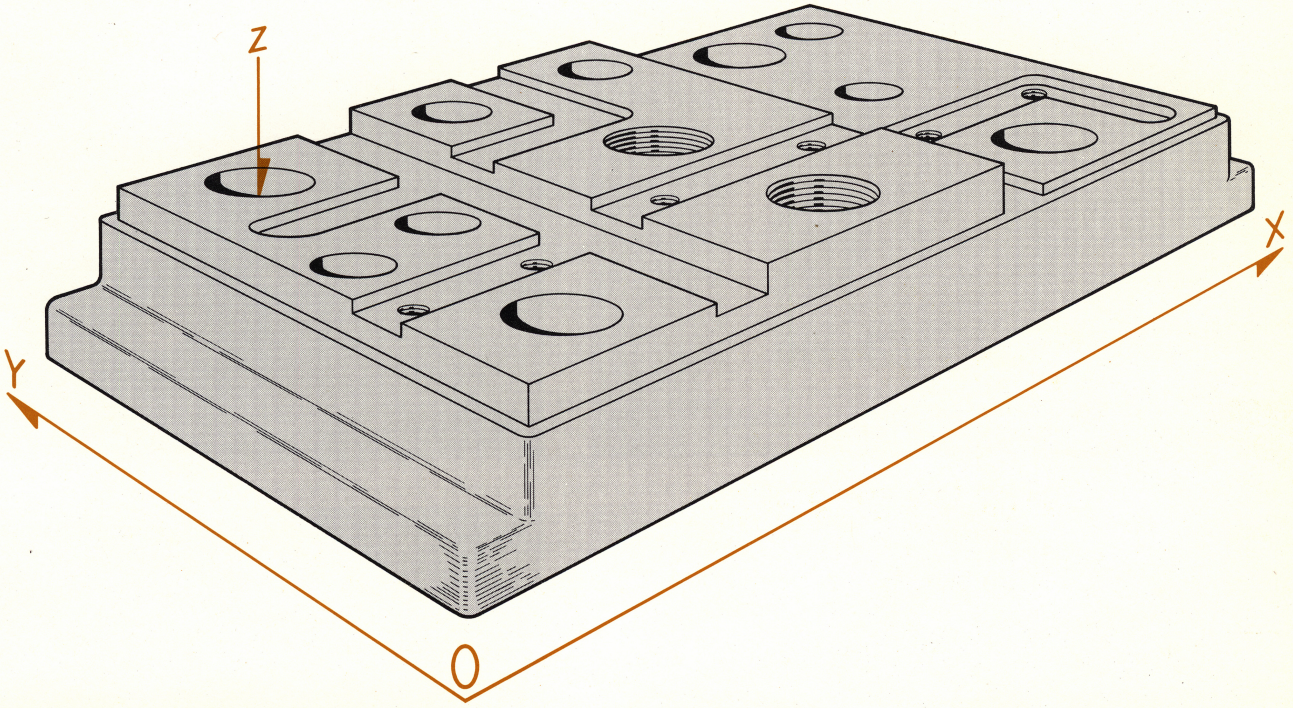
An entire cycle is programmed in the one sequence . . . in this particular case a drilling cycle, as called for by code G 81 in the "Preparatory Function" column. The Cintimatic tool length compensator permits direct programming of hole depth with relation to the work surface. In drilling to a 5/8" depth, code Z 0625 is entered in "Z Feed Position" column, and the 10 IPM feed rate is entered in the "Z Feed" column as code F 510. By tape command, the tool will rapid to a point just above the work surface, drill to the programmed depth at the programmed feed rate, then rapid retract automatically.

Program tapes for the Cintimatic Numerically Controlled Turret Drill are 1", 8-track perforated, per EIA Standard RS-244, using word address format.

First quadrant programming is an outstanding Cintimatic advantage.* Note, in the drawing, that the X and Y axes meet at point 0 which has been "Zero shifted" to the left front corner of the table. In programming the hole positions, all measurements along both the X and Y axes are made from the 0 point. There is no need for the programmer to use plus or minus figures as would be the case if the X axis intersected the Y axis at midpoint. This is a big reason why Cintimatic programming is so easy.

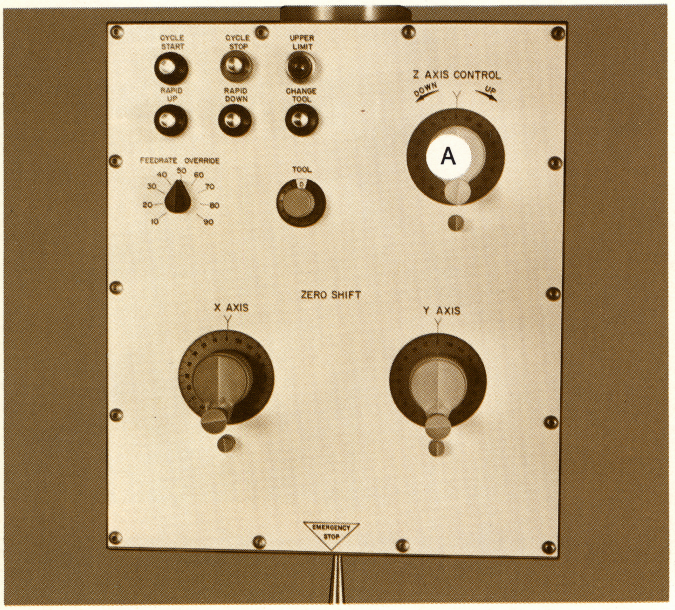


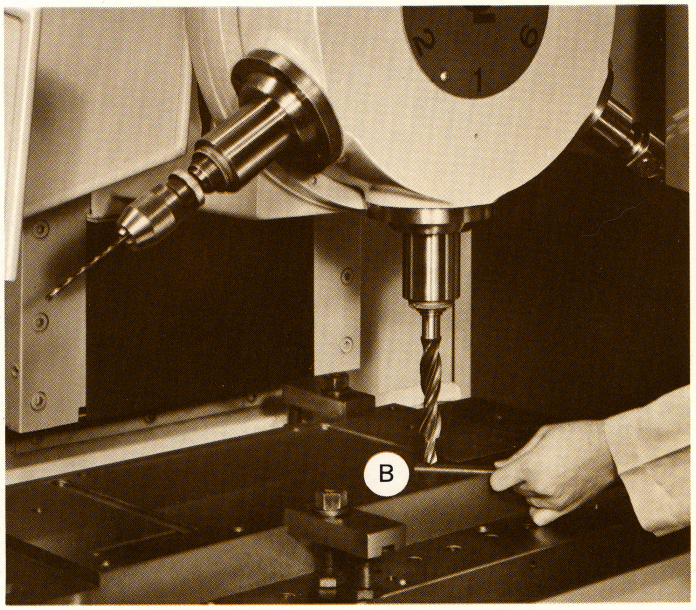
**Optional Axis Inversion* (Mirror Image) permits machine operations in all four quadrants *without* reprogramming or making a new tape. Programming with Axis Inversion calls for positive values in the first quadrant, with X and Y axis on-off switches that enable the console to "invert" the positive values to negative values, thus creating a mirror image in each of the four quadrants. To machine a regular bolt hole circle, for example, would require programming only one fourth of the circle, using the Axis Inversion capability to create the other three-fourths from the same tape.

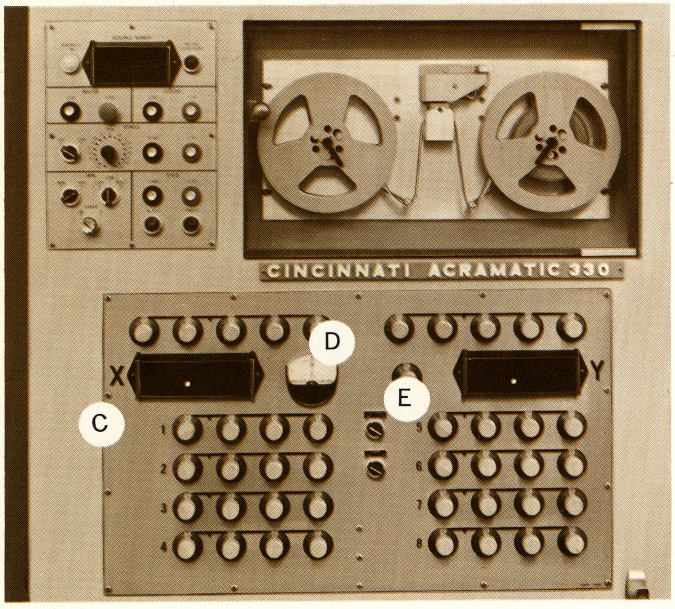


tape punching is a fast, simple clerical job

The next step is a simple clerical job . . . punching information from the program form into the tape using standard commercial tape punch equipment. It merely means entering the programmed numerical commands on a keyboard similar to a typewriter or adding machine. Code deletes are permitted, thus promoting important time savings in tape punching. Tab codes may also be used for good programming form layout, and easy reading and checking.


CYCLE START
CYCLE STOP
UPPER LIMIT
RAPID UP
RAPID DOWN
CHANGE TOOL
Z AXIS CONTROL
DOWN
UP
A
FEEDRATE OVERRIDE
TOOL
ZERO SHIFT
X AXIS
Y AXIS
EMERGENCY STOP


B


CINCINNATI ACRAMATIC 330
D
X
Y
E
C


F
CINCINNATI



five steps to fast and easy cintimatic set up

1. **POSITIONING THE WORKPIECE.** Using simple vises, clamps or fixtures, the operator positions the workpiece on the table in the same relationship to the X and Y axes as was planned at the programming stage. Full range zero shift makes this easy, fast and accurate. With zero shift controls (continuously graduated handwheels) located on the pendant station, the relationship of the X and the Y axes may be modified at will. This zero shift covers the entire range of the table travel.

2. **INSERTING THE TOOLS.** Required tools are inserted in the correct spindles. Tool length need not be preset. The unique tool length compensator adjusts for tool length as described in step 3.

3. **COMPENSATING FOR TOOL LENGTH.** To compensate for tool length, the operator feeds the turret carrier with the rapid advance control and handwheel A until the tool touches the feeler gage B resting on the work surface. With the tool still resting on the feeler gage, the operator adjusts the No. 1 tool length compensator controls C on the console for spindle station No. 1 until the needle on the compensator dial D rests on zero. This adjusts the control circuit for the tool length and work height and establishes the zero starting point for that tool. The depth is then tape controlled from this point. Four tool length compensator control switches, providing adjustments from inches down to thousandths, are provided for each of the six or eight spindles.

   When the operator completes the tool length compensating procedure for the No. 1 tool, he retracts the turret and indexes to the next position, using the pendant controls. The same procedure is repeated until tool length compensations have been made for all spindles. Time required . . . less than one minute for each spindle.

4. **ADJUSTING FOR WORK CLEARANCE—TURRET INDEX.** Using the adjustable upper limit control E, located on the Acramatic console, the operator sets the height at which all tools will clear the work when the turret indexes.

5. **STARTING AUTOMATIC OPERATION.** After completing the adjustments, the operator loads the tape into the reader, presses the cycle start button F, and automatic production begins. That's it . . . the fast, simple Cintimatic set up method leading to outstanding economies on short production runs or small job lots.

optional equipment increases cintimatic versatility

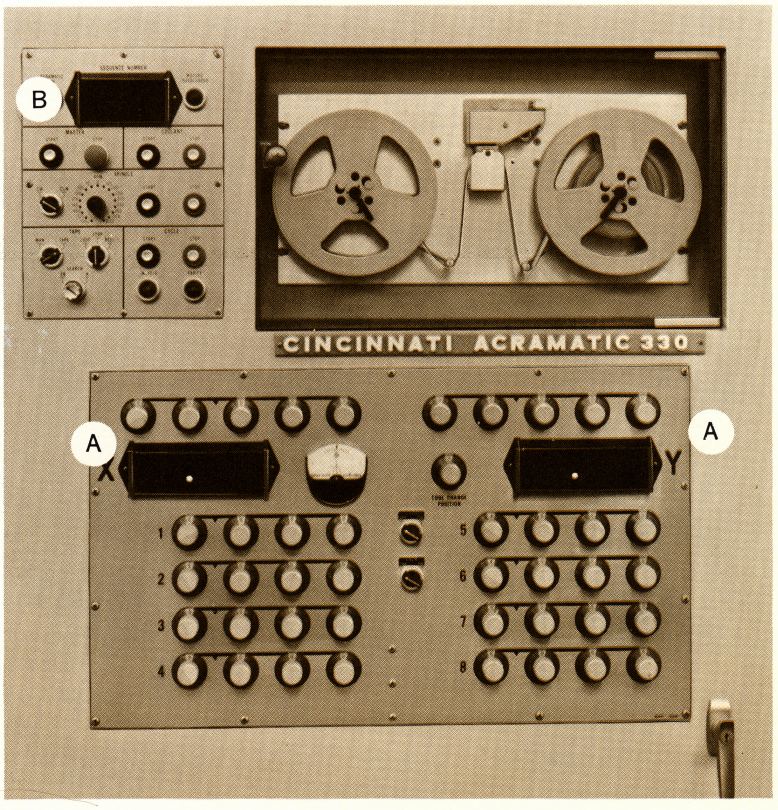
In designing the Cintimatic Numerically Controlled Drill, careful attention was given to making it suitable for a wide range of assignments. It is designed to handle all jobs from one-of-a-kind to small production runs. To help accomplish this versatility, a number of optional equipment items are available.

READOUT LIGHTS. Five-digit readout lights (A) indicate the programmed position of the work table. Three-digit lights (B) indicate the operation or sequence number being performed. The operator can quickly determine the production stage of the work by referring to the program sheet.

OVERHEAD WIREWAYS. Control cables between machine and console go overhead in metal ducts. Reduces chance of accidents, keeps cables away from grease, oil and chips. Overall height remains the same.

TAPE CONTROLLED COOLANT SYSTEM. When a coolant system is ordered with the machine, coolant on-off may be programmed and automatically controlled by tape if specified. Manual control is also built into the console.

AUTOMATIC LUBRICATION. A time-controlled lubrication system supplies oil to table and turret components susceptible to wear. Works automatically, eliminates oversight.



SPARE PARTS KIT. The spare parts kit contains a variety of module units used in the console, thereby providing replacement parts for virtually every type of breakdown. It is the best insurance against unscheduled downtime.

RISER TABLES. These aluminum riser tables raise the height of the work surface by 4-inch and 10-inch increments. They bolt to the machine table and have the same tongue and T-slot pattern as standard tables.

GRID PLATES. These speed and simplify set-up . . . contain plug holes for work location and threaded holes for work clamping.

ADDITIONAL OPTIONAL ITEMS: Tap holders. Tool holders. Spindle adapters. Metering devices. Work light.

spiral point drills give maximum cintimatic benefits

Cintimatic Numerically Controlled Turret Drills virtually eliminate the need for guide bushings to locate hole positions. Because spiral point drills are self-centering, guide bushings are not needed to start the drill on location and to maintain accurate hole size. Similarly, they make center drilling unnecessary. For these reasons, spiral point drills are strongly recommended for use with the Cintimatic Numerically Controlled Turret Drill.

Spiral point drills are ground on the Cincinnati Spiropoint Drill Sharpener. For complete information on this machine, ask your Cincinnati Lathe and Tool Co. distributor for Catalog SP-165.

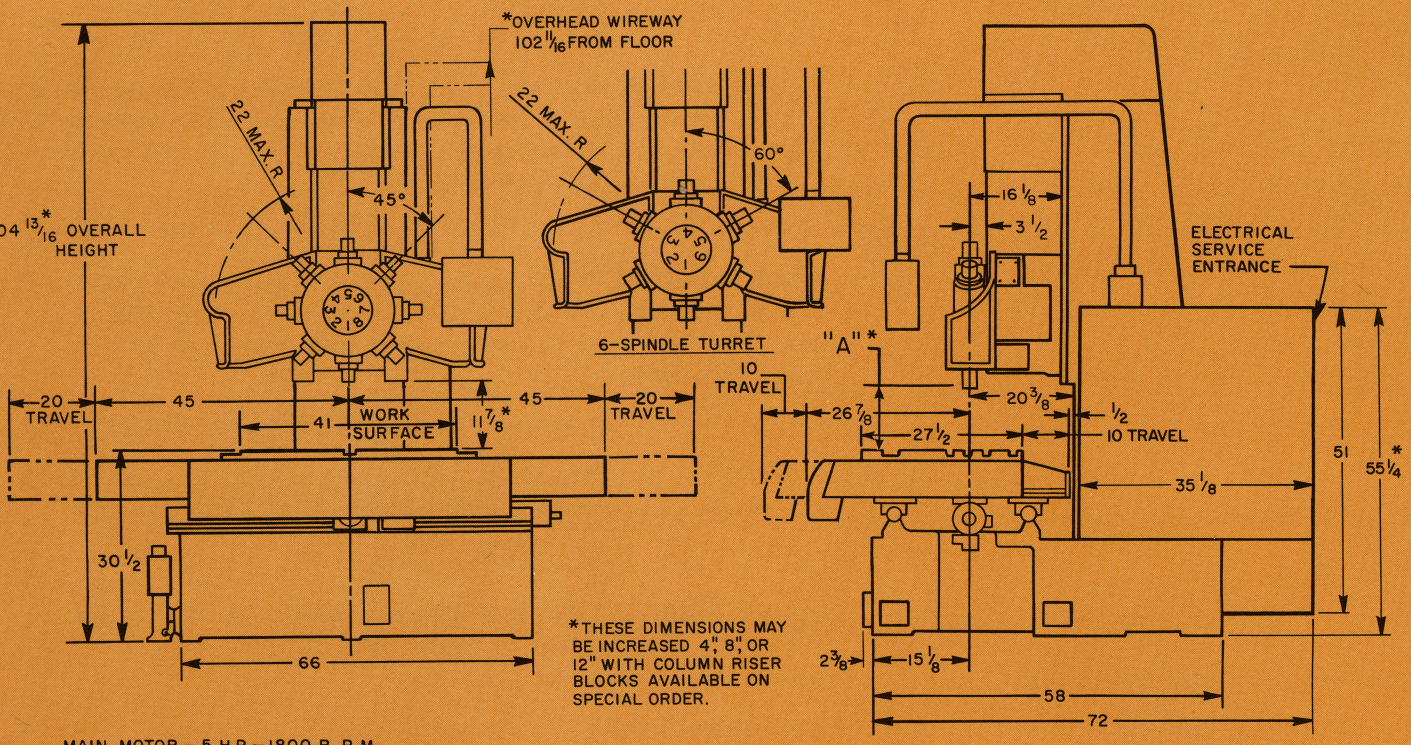
single-source service . . . cincinnati

When you own a Cintimatic Numerically Controlled Turret Drill you deal with a single source for service . . . Cincinnati. By making full use of these services you can get into numerical control, and obtain its many advantages, quickly and smoothly.

Your designated personnel can attend programming classes, at no charge, which are held frequently in Cincinnati. This assures that proper programs and tapes are ready to go as soon as the machine is installed. Suitable programming forms and aids are available, too.

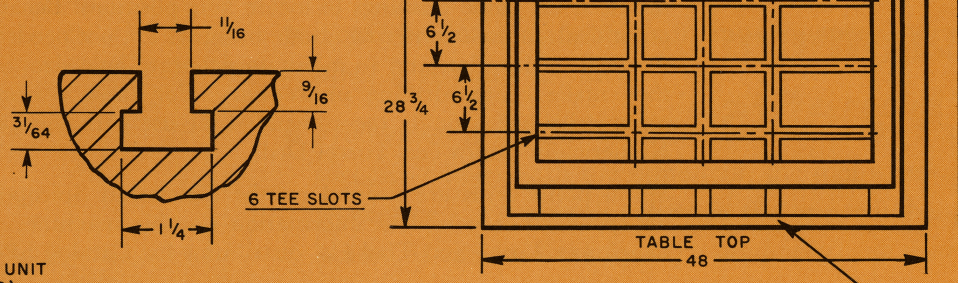
Maintenance classes are also held to acquaint your personnel with operation and adjustment of the machine, and preventative maintenance procedures. Trouble shooting test tapes, the stocking of recommended spare parts, and proper test equipment are emphasized in this program.

The next service phase is the installation of the Cintimatic in your plant. After it is erected, our specialists check out the whole system and instruct your personnel in its operation.

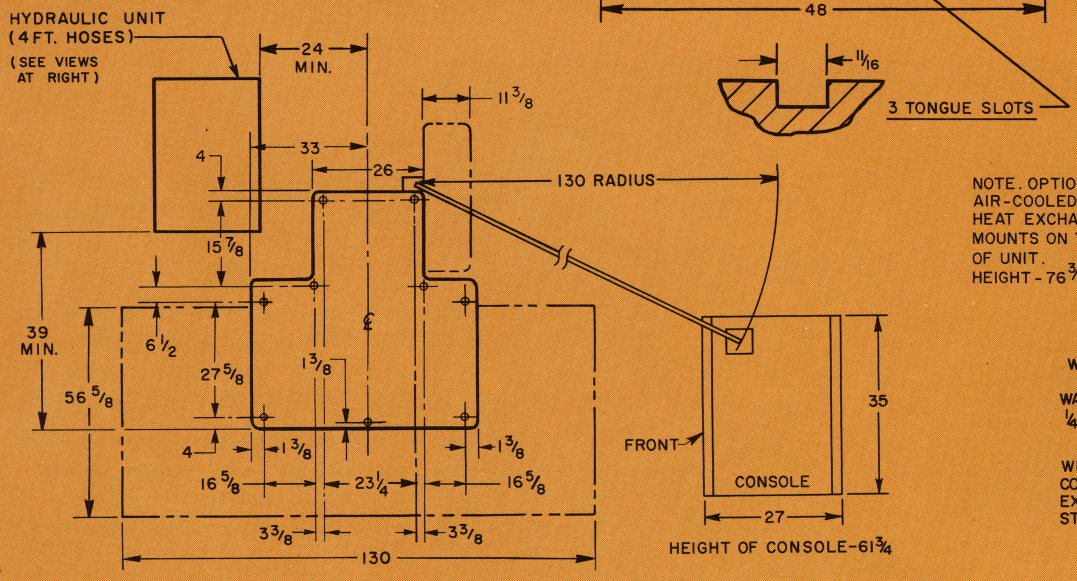


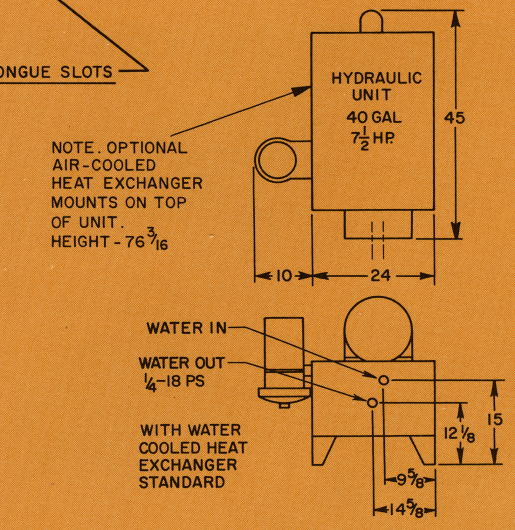
MAIN MOTOR – 5 H.P. – 1800 R. P. M.
" " 2 1/2 H.P. – 900 R. P. M.

HYDRAULIC MOTOR – 7 1/2 H.P. – 1800 R.P.M.



DISTANCE FROM TABLE TOP TO SPINDLE – DIM. "A" *		
SPINDLE TYPE	"A" MAX.	"A" MIN.
1 3/8 STRAIGHT BORE	25	11 3/4
NO.4 MORSE TAPER	25 1/2	12 1/4
NO.30 UNIVERSAL KWIK SWITCH	26 3/16	12 15/16
NO.30 DEVLIEG FLASH CHANGE	26 1/16	12 13/16
NO.30 ERICKSON QUICK CHANGE	26 5/16	13 1/16





specifications

MACHINE

Capacity in mild steel	1¼″
No. of spindles	6 or 8
Diameter of spindle nose	2⅜″
Spindle bore	Optional — see table on page 18
No. of spindle speeds	16
Spindle speed range	70 to 2120 RPM
No. of spindle feed rates	185
Spindle feed rates	½″ to 99″
Spindle rapid traverse	140 IPM
Spindle travel (feed and rapid)	13¼″
Z axis programmed depth	9.999″
Z axis tool length compensation	9.999″
Tool length compensation feeler gage thickness	.100″
Minimum rapid traverse	1″
Z axis accuracy absolute	±.002″
Z axis repeatability	±.001″
Z axis handwheel movement	.200″/rev.
Distance spindle nose to table	Varies with spindle type — see table on page 18
Spindle H.P.	5/2.5
Gross shipping weight	14,000 lbs.

OVERALL DIMENSIONS INCLUDING TABLE TRAVEL

Front to back	98″
Side to side	130″
Height	105″

TABLE

Working surface	25⅜″ x 41″
Travel longitudinal X axis	39.999″
Travel longitudinal Y axis	19.999″
Width tee slots	11/16″
Table positioning accuracy	±.001″ in 24″
Table positioning repeatability	±.0005″
Rapid traverse rate	200 IPM
Milling feed rate (programmed)	2 to 99 IPM
X-Y zero shift	full range
Table movement	Recirculating anti-backlash ball screws
Table bearings	Recirculating ball bushings on 2″ dia. hardened steel rods
No. of tee slots—X and Y axis (standard)	3 each axis

NUMERICAL CONTROL

System	Cincinnati 330 Acramatic
Format	Word address
Tape size	1″ 8-track
Servo system	Electro hydraulic Type 1 on all axes
PAU input	.200/rev.
Tape reader speed	60 rows per second
No. of axes controlled	3
Console dimensions (overall)	24″ x 30″ x 60″

LUBRICATION

Transmission	oil spray
Turret head	mist lube
Ramway gibs	grease

Specifications subject to change without notice

STANDARD EQUIPMENT

Complete drilling machine including motor, controls, positioning table and six-spindle or eight-spindle turret. Acramatic control console with tape reader and air conditioner. Hydraulic pump and tank unit.

CINCINNATI LATHE AND TOOL CO.
WILMINGTON, OHIO 45177
Subsidiary of The Cincinnati Milling Machine Co.

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