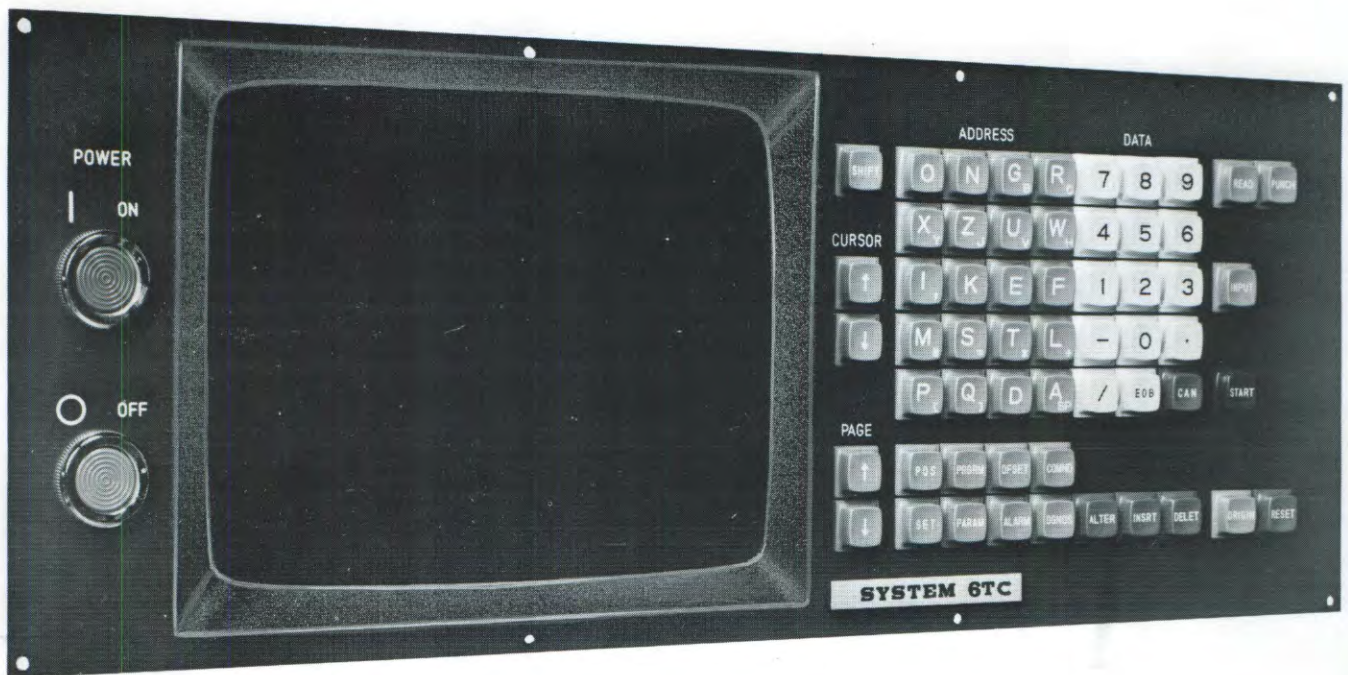


GENERAL NUMERIC

General Numeric
6TC Microprocessor CNC
for 4-Axis.

GN 6TC

TURNING



HIGH PERFORMANCE, EXTREMELY HIGH RELIABILITY

Overall reliability has been increased and performance/cost ratio substantially improved with many excellent pioneering techniques such as adoption of "Bubble Memory", high-speed microprocessor, custom LSI's, etc. Moreover, since cabinets are totally enclosed constructions using unique heat exchanger, they have long-lasting, high reliability.

If a drift in the servo loop occurs, it is automatically compensated to maintain accurate positioning in long runs.

Very careful selection of components and extensive performance testing before shipment insure long-lasting trouble-free operation.

AUTOMATIC RECOGNITION OF EIA OR ISO (ASC11)

After reading the first EOB code, either EIA or ISO code is automatically selected.

TWO INDEPENDENT PROGRAM

This allows the programmer to program for each tool post independently. Cumbersome jobs in the sequencing of motion of the turrets can be eliminated from the profile programming stage. "Just Waiting" M codes can be inserted after completion of both programs.

TEMPORARY STOP OF THREAD CUTTING

Temporary stop during thread cutting cycle (G92, G76) is possible. Thread cutting cycle is continued by cycle start button.

TOOL NOSE RADIUS COMPENSATION

Tool center path is automatically generated from profile by offsetting tool nose radius, so that higher accuracy and fine adjustment are possible without the need for tedious calculations or the use of a computer. Furthermore, the setting point of tool nose can be specified. Compensation and offset pairs can be expanded up to 32 pairs per each tool post.

DECIMAL POINT PROGRAMMING

Decimal point can be used in the dimension word and is displayed with it. Therefore, the dimensions, the positions and the feed rates can be verified at a glance.

AUTOMATIC INSERTION OF CHAMFERING AND CORNER ROUNDING

Chamfering and Corner Rounding are programmed without computation.

INCH/METRIC CONVERSION

Any one of the following is possible.

1. Inch dimension input to a machine tool with inch ball screw.
2. Inch dimension input to a machine tool with metric ball screw.
3. Metric dimension input to a machine tool with inch ball screw.
4. Metric dimension input to a machine tool with metric ball screw.

As inch/metric conversion is designated by G code, the erroneous operation caused by operator's mistakes can be eliminated.

COMBINED USE OF ABSOLUTE AND INCREMENTAL DIMENSION DATA WITHIN THE SAME BLOCK

For absolute dimensions X/Z word addresses are used, and for incremental dimensions U/W. In the same block, X/W or U/Z may be programmed, as well as X/Z or U/W.

DIRECT PROGRAMMING IN INCH/REV. OR MM/REV.

Since feed is synchronized with spindle revolution, surface finish remains unchanged in spite of drift of spindle speed. INCH/MIN. OR MM/MIN. programming is also available.

RAPID TRAVERSE OVERRIDE

One of 100%, 50%, 25% and predetermined slow speed is selectable as a rapid traverse override. Therefore, tape verification has become easier.

INCREMENTAL FEED

Movement amount per step by manual feed, 0.0001, 0.001, 0.01, 0.1, 1 and 10 inches (0.001, 0.01, 0.1, 1, 10 and 100mm) are available.

RUN HOUR DISPLAY

Automatic operation time of the machine can be integrated and displayed to the second. Reset is also possible. The result is easier progress management of work, tool management and maintenance.

THREAD CUTTING BY E6-DIGIT COMMAND

Lead of thread cutting can be designated by the unit of 0.000001 inch or 0.0001 mm. Therefore, an odd-lead thread (e.g. unified thread) can be machined with high accuracy.

CONSTANT SURFACE SPEED CONTROL (patent pending)

Retains surface speed constant for superior surface finish, lengthens tool life, reduces tape length and of course simplifies programming. Even if the tool moves in rapid traverse, it is so designed that the spindle speed responds as quickly as possible to reduce the cycle time. (patent pending)

Also in a single-spindle lathe, the program for each tool post specifies constant surface speed control simultaneously. The PC program determines which program is to take precedence.

STORED STROKE LIMIT (patent pending)

Forbidden area can be established by parameters or program. Outside of boundary for the forbidden area is selected by parameters. It can prevent tool from colliding with chuck or jig caused by programming mistake or erroneous operation.

PART PROGRAM STORAGE AND EDITING (patent pending)

- stores part programs and sub-programs in the memory. Capacity: 49.5 ft. (15m) of tape information as standard and 115.5/264/1056 ft. (35/80/320 m) per each tool post as option.
- allows tapeless operation by part program or user macro stored in the memory and by calling the stored sub-program as required.
- searches, deletes and corrects stored words, and blocks and inserts new words.
- searches and deletes part programs stored in memory.

- operates the machine by the corrected part program.

- records edited part programs permanently on paper tape by connecting FACIT 4070 or I/O device with ASR 43/33 or RS232C interface. (option)

This simplifies the speeds up program debugging and correction.

The part program stored in the memory can be quickly modified to machine under the most suitable cutting condition. Furthermore, a large program memory capacity is available. It can store machining programs for days or months just like DNC. As bubble memory is employed, memory is retained without battery back-up.

EASIER MAINTENANCE

Maintenance of the GENERAL NUMERIC SYSTEM 6T is extremely easy.

- Thanks to self-diagnostic capability, internal operating conditions can be continuously monitored, data can be checked, etc. in the event of malfunction, operation ceases immediately and the source of malfunction is detected and displayed as much as possible.

- All On/Off signals going out of and into the logics can be shown on the display even during cycle operation.

- All signals going out of and into the NC can be checked at the connectors.

- Any On/Off signal going out of the NC can be issued manually through the manual data input in bit-by-bit manner.

- Various preset parameters such as acceleration/deceleration time constants and rapid traverse speed can be shown on the display.

- Causes for alarm are classified in detail (about 130 kinds for each tool post) and shown on the display.

- NC operating status is continuously displayed based on 9 kinds of classification for each tool post.

- Signals from pulse coder and position coder appear on display.

AUTOMATIC ACCELERATION/ DECELERATION FOR FEED

Exponential type acceleration/ deceleration can be carried out during cutting feed and JOG feed. Use in combination with large-scale servo motors.

OPTIONAL FEATURES

CIRCULAR INTERPOLATION BY RADIUS DESIGNATION

Circular interpolation is directly specified by the end point of an arc (X, Z) and the radius (R).

Thus, no auxiliary calculations for center coordinates are necessary. (The conventional method using parameter I and K is also possible.)

PROGRAM RESTART

With this function, it is possible to

restart machining by setting the desired sequence number of the program being used. The NC stores in memory and modal status from the program start to the given sequence number. To attain a desired M, S, T-Code, first output the code on the MDI, then push the start button: the tool will automatically move to the start position and machining will restart.

DIRECT INPUT OF OFFSET VALUE MEASURED

First cut the workpiece manually, taking measurement of the cut diameter or length. Then input this measurement value into the MDI, and the offset value will be set.

AUTOMATIC REFERENCE POINT RETURN AND CHECK

With this function, tool is automatically returned to the reference point, through the point specified by the program. The lamp indicates whether or not the tool has been correctly returned.

AUTOMATIC COORDINATE SYSTEM SETTING

When tool is returned to the reference point manually, the specified coordinate system is automatically set.

WORK COORDINATE SYSTEM SHIFT

Shifting of the work coordinate system, i.e. the entire tool path required for machining, is possible, for compensation of work chucking variation, tooling system variation, etc.

AUTOMATIC TOOL COMPENSATION

When the tool nose comes in contact with a sensor located at a premeasured position, the tool offset value is automatically calculated and stored in the memory.

EXTERNAL TOOL COMPENSATION

A measuring device is installed in the machine tool and, when measured, correct value of tool compensation is input to the NC, the offset value can be changed accordingly.

EXTERNAL WORK NUMBER SEARCH A

With this function, remote instructions (e.g. from the machine) can indicate selection from the NC memory of the machining program required and thereby execute that program.

Up to 31 machining programs can be stored at each tool post.

BUBBLE CASSETTE

Compact and easy-to-use bubble cassettes (patent pending) can be used for transfer and storage of NC command data. LSI cassette can also be used.

SKIP FUNCTION

Upon remote signaling, the remaining area of linear interpolation can be skipped and processing will proceed immediately on to the succeeding block.

PC (PROGRAMMABLE CONTROLLER)

Thanks to a unique functional instructions, the NC-incorporable General Numeric PC can carry out even complicated power sequence control functions with ease.

MODEL B: Max. 5,000-step
DI: Max. 192 pt.
DO: Max. 128 pt.

INTERFERENCE CHECK

When programming two turret lathes, it is cumbersome for the programmer to avoid one turret from interfering with the other. By using this option the programmer can write the program without concern for the turrets colliding.

BALANCE CUT

By using two bites to cut the same profile, it is possible to cut a long workpiece without having the inaccuracy caused by bending of workpiece; no steady rest is required. This function is unique to GN. No other NC comes close.

VARIABLE-LEAD THREAD CUTTING (option)

Variable-lead threads can also be machined. Both single- and twin-spindle lathes can machine different-lead threads simultaneously using two cutting tools.

USER MACRO

With user macro (body) the user can program, store, recall and execute his own automatic cycles, family programs, etc. The user or machine tool builder creates his own software, thereby permitting unique software designed to match the needs of the given NC machine tool, for enhanced functional expandability and individually tailored work capability.

- variables can be used.
- inter-variable calculations (add/subt-mult/div, trigonometry, binary/decimal transformations, etc.) are possible.
- branching is possible.

TECHNICAL SPECIFICATIONS

STANDARD

- **Controlled Axes:** 2 axes (X₁ and Z₁) + 2 axes (X₂ and Z₂)
- **Simultaneously Controllable Axes:** 2 axes (Each tool post is controlled separately.)
- **Increment System:** Refer to table 1
- **Tape Code:** EIA RS-244-A/ISO840(EIA358)
- **Tape Format:** Refer to table 2

■ Decimal Point Programming

■ **Maximum Programmable Dimensions:** ± 8 digits, Refer to table 1

■ **Rapid Traverse:** Refer to table 1

■ **Feed rate designation:** Direct Programming in inch/rev. or mm/rev. (Manual override 0 ~ 200%) inch/min or mm/min is also possible

■ **Automatic Acceleration/Deceleration:** Linear for rapid traverse, exponential for feed

■ **Combined Use of Absolute/Incremental Programming in the same block of tape**

■ **Programing of Absolute Zero**

■ **Positioning, Linear Interpolation, Circular Interpolation (multiple quadrants)**

■ **Thread Cutting:** Refer to table 1

■ **Buffer Storage**

■ **Dwell**

■ **Auxiliary Function:** M2 + M2

■ **Spindle Function:** S4 + S4

■ **Tool Offset (per each tool post):** ± 6 digits, 32 pairs in memory

■ **Dry Run**

■ **Keyboard-type Manual Data Input (MDI) and CRT Display**

■ **Part Program Storage and Editing (per each tool post):** Capacity; 49.5 ft (15 m) of tape information

■ **Self Diagnosis**

■ **Back Lash**

■ **Compensation:** Refer to table 1

■ **Single Block Operation**

■ **Optional Block Skip**

■ **Manual Absolute ON/OFF**

■ **Interlock**

■ **Machine Lock**

■ **Auxiliary Function Lock**

■ **Overtravel**

■ **Remote Power ON/OFF**

■ **Manual Slide Movement:** (JOG and STEP feed)

■ **Feed Hold**

■ **Sequence Number Display:** 4 digits, Independent other than data

■ **Sequence Number Search**

■ **Program Number Search**

■ **Constant Tangential Feed Rate Control**

■ **Tool Post Selector Switch**

■ **Emergency Stop**

■ **Incremental Feed:** Movement amount per 1 step; 0.0001, 0.001, 0.01, 0.1, 1 and 10 inch or 0.001, 0.01, 0.1, 1, 10 and 100mm

■ **Canned Cycles:** G90, G92, G94

■ **Constant Surface Speed Control B:** Analog output

■ **Reference Point Return A:** Manual Automatic (G27, 28, 29)

■ **Rapid Travers Override:** FO, 25%, 50%, 100%

■ **Tape Punch Interface:** EIA RS232C, FACIT4070, or ASR 43/33

■ **Inch/Metric Conversion:** Switchable by G codes

■ **Precision thread cutting by E code**

■ **Full Automatic Tool Nose Radius Com-**

ensation

■ **Stored**

- **Safe Zone Program**
- **Radius Programming on X-axis**
- **ISO code Input:** ISO 840 (Automatic recognition of EIA/ISO)
- **Automatic Acceleration/Deceleration for feed**
- **Run Hour Display**
- **Feedback:** Pulse Encoder
- **Power Supply:** AC 200/220/230/240/380/415/440/460/480/ 550 V + 10%, -15%, 50/60 H - 1HZ, 3 phase

OPTIONS

- Part Program Storage and Edit B/C/D/E/F:** B 132 ft., C 262 ft., D 1050 ft., E 2100 ft., F 4200 ft. per each tool post
- Constant Surface Speed Control A:** 12 bits binary output
- Reference Point Return B:** Manual Automatic (G27, 28, 29, 30). Return to the 2nd reference point is also available.
- Automatic Program Zero Set**
- Work Zero Shift**
- Simplified offset data input**
- Manual Pulse Generators 2 sets:** Multiplication (X1, X10, X100) is possible.
- Addition of Registerable Programs (per each tool post):** Total 191 (This option is

possible only when part program storage capacity is 264/1056 ft.)

- Remote Type Position Display**
- Motion Skip**
- Tool Retract During Threading Cycles**
- Variable Lead Thread Cutting**
- Multiple Repetitive Cycle A:** G70, 71, 72, 76
- Multiple Repetitive Cycles B:** G70 ~ 76
- Multiple Repetitive Cycles C:** G70 ~ 76
- Automatic Chamfer and Corner Rounding**
- Multiple Optional Block Skip**
- Program Restart**
- Automatic Tool Compensation**
- External Tool Compensation:** GENERAL NUMERIC PC-MODEL B is necessary
- External Program Number Search A**
- External Data Input:** Alarm message and operator message can be displayed. GENERAL NUMERIC PC-MODEL B is necessary).
- User Macro (A/B:** sophisticated parametric subroutine)
- Programmable Controller:** GENERAL NUMERIC PC-MODEL B (Max. 5000 steps, DI; 192 points, DO; 128 points)
- Electric Spindle Orientation Control**

- Bubble cassette and Adaptor**
 - Interference check**
 - Balance cut**
 - Servo Motors:** GENERAL NUMERIC DC Servo Motor
 - Servo Amplifiers:** PWM Transistor drive
 - Tape Reader:** Without Reels; (For built-in type 2 and built-in type 3 cabinets) 300 ch/sec (60 Hz) 250 ch/sec (50 Hz) Photoelectric (light emitting diodes) Tumble box capacity: 99 ft. (30m)
 - Portable Tape Reader (with RS 232 C interface)** (For built-in type 1 cabinet) Read: 300 ± 30 ch/sec (60Hz); 250 ± 25 ch/sec (50Hz)
- Read direction: Positive only
Method: Photoelectric (LED)
Interface: Serial interface (EIA RS 232 C)
Baud rate: 4800 BPS
Power supply: AC 200/220V + 10/ -15%, 50/60 Hz ± 1 Hz
Power Capacity: 110VA
Weight: 15kg
Position Coder: Maximum speed 4000 rpm or 6000 rpm
Pulse Encoder: 2000 pulses/2500 pulses/300 pulses

Table 1. Range of command values

	Metric thread for feed screw		Inch thread for feed screw	
	Metric input	Inch input	Inch input	Metric input
Least input increment	0.001 mm/0.01 mm*	0.0001 inch	0.0001 inch	0.001 mm
Lease command increment	x: 0.0005mm/p ** x, z: 0.001 mm/p	x: 0.0005mm/p ** x, z: 0.001mm/p	x: 0.00005 inch/p ** x,z: 0.0001 inch/p	x: 0.00005 inch/p** x,z: 0.0001 inch/p
Max. programmable dimensions	± 99999.999 mm	± 3937.0078 inches	± 9999.9999 inches	± 99999.999 mm
Max. rapid traverse speed	1 ~ 15000 mm/min	1 ~ 15000 mm/min.	0.1 ~ 600 inch/min.	0.1 ~ 600 inch/min.
Feed rate command	Per rev.	0.01 ~ 500.00 mm/rev.	0.0001 ~ 50.0000 inches/rev.	0.01 ~ 500.00 mm/rev.
	Per min.	1 ~ 15000 mm/min.	0.01 ~ 600.00 inches/min.	1 ~ 15000 mm/min.
Thread lead command	F4	0.01 ~ 500.00 mm	0.0001 ~ 50.0000 inches	0.01 ~ 500.00 mm
	E6	0.0001 ~ 500.0000 mm	0.000001 ~ 9.999999 inches	0.000001 ~ 9.999999 inches
JOG feed rate	1 ~ 2000 mm/min.	1 ~ 2000 mm/min.	0.02 ~ 40.00 imp	0.02 ~ 40.00 imp
Incremental feed	0.001/0.01/0.1/1/10/100 mm/step	0.0001/0.001/0.01/0.1/1/10 inch/step	0.0001/0.001/0.01/0.1/1/10 inch/step	0.001/0.01/0.1/1/10/100 mm/step
Rapid traverse override	Fo*, 25%, 50%, 100%	Fo*, 25%, 50%, 100%	Fo*, 25%, 50%, 100%	Fo*, 25%, 50%, 100%
Tool offset	0 ~ ± 999.999 mm	0 ~ ± 99.9999 inches	0 ~ ± 99.9999 inches	0 ~ ± 999.999 mm
Dwell time	0 ~ 9999.999 sec.	0 ~ 9999.999 sec.	0 ~ 9999.999 sec.	0 ~ 9999.999 sec.
Backlash compensation	0 ~ 0.255 mm	0 ~ 0.255 mm	0 ~ 0.0255 inch	0 ~ 0.255 inch

**In case of diameter programming *Setting by parameter

Table 2. Detailed format classification (including options)

Metric system	004. N04. G02. αL + 053. βL + 053. ID053. KD053. F050/F042/E034. S02/S04.T04.L04.P053.M03*
Inch system	004. N04. G02. αL + 044. βL + 044. ID043. KD044. F031/F034/E016. S02/S04.T04.L04.P053.M03*

(Note) α: X or U, β: Z or W

GENERAL NUMERIC
Making U.S. Industry More Productive.

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