CHAPTER 1

SPECIFICATION FOR THE BRIDGEPORT E-CNC

1.1 GENERAL

The BRIDGEPORT E-CNC is a cost effective CNC providing functionality previously offered only in expensive high performance CNCs. The E-CNC offers comprehensive 3-dimensional operation with linear and circular interpolation in all axes and a helical interpolation mode combining circular interpolation in the XY plane with linear interpolation in the Z plane. Emphasis in the Control has been placed on the use of many canned cycles in the milling and drilling modes to simplify part programming.

The E-CNC is a compact design made possible through the extensive use of VLSI (Very Large Scale Integrated) circuits, and an internal hardware architecture that uses four microprocessors; dual microprocessors in the operator/programmer interface, a microprocessor to control and continuously monitor performance of the axis drives, and a microprocessor used as a programmable controller for auxiliary machine functions.

An alphanumeric 40-character LCD is provided to assist the programmer in entering manual data input. Editing capabilities are provided on the Front Panel to modify a part program if necessary.

The E-CNC incorporates permanent, semi-permanent and programmable software storage in optimum combination to utilize each one to its maximum advantage. BOSS 8 I, the Bridgeport Operating System Software, Series I, is embedded in firmware. The part program storage area is equivalent to 100 feet of NC tape and is non-volatile. The contents are saved when power to the system is removed.

The data input-output interface has been expanded. Conventional 20mA and RS-232 are available at the Port A serial interface, RS-232 and RS-422 are available at the Port B serial interface. In addition, software has been included in the Port B line to handle two different remote data protocols, one of which supports data verification and retries. The E-CNC has been designed to

link up effectively with Bridgeport's EZ-CAM~ part programming system and EZ-FILE mass storage device.

1.2 MACHINE DESCRIPTION

The Series I CNC machine is a new version of the familiar Bridgeport Series I CNC Vertical Milling Machine and is specifically designed to the needs of Numerical Control. It has special dual knee locks (manually adjusted) to clamp the knee to the column. The knee has additional way area at the top to carry the extended deep saddle, and the table is designed for an automatic machine tool. The machine ways are chrome plated for long life, and lubricated by an automatic one-shot system. The X and Y axis drives are suspended clear of the operator's working area, and in such a way, that they will not induce any bending moment on the table. The X axis drive motor is mounted on the saddle where it gets better support and drives the ball nut of a stationary ballscrew, while the Y axis motor is mounted on the knee and rotates the Y axis ballscrew. Ballscrews are totally enclosed and mounted in the center of the guideways. The rigid milling head, supported from the column by a rigid ram, is rated at 2 HP and has a fan cooled 2 HP AC induction motor. The Z axis drive arrangement is in the milling head, and drives the quill through the rotation of the nut in a preloaded recirculating ballscrew. The ballscrew axis is concentric with the quill, and is concentric with the axis rotation of the spindle. This gives precise, repeatable control and additional support to the quill. The spindle terminates for #30 MMT quick change tool holders. Closed loop DC servo drives are furnished as all three axes with encoder feedback to give fine resolution and high speed traversing. Great attention has been given to chip and coolant collection: A gutter cast into the table completely surrounds the working surface and is provided with drains and chip screens. The working surface is also surrounded on three sides by a polycarbonate chip and coolant shield, and on the floor is a catchment pan to collect overflow.