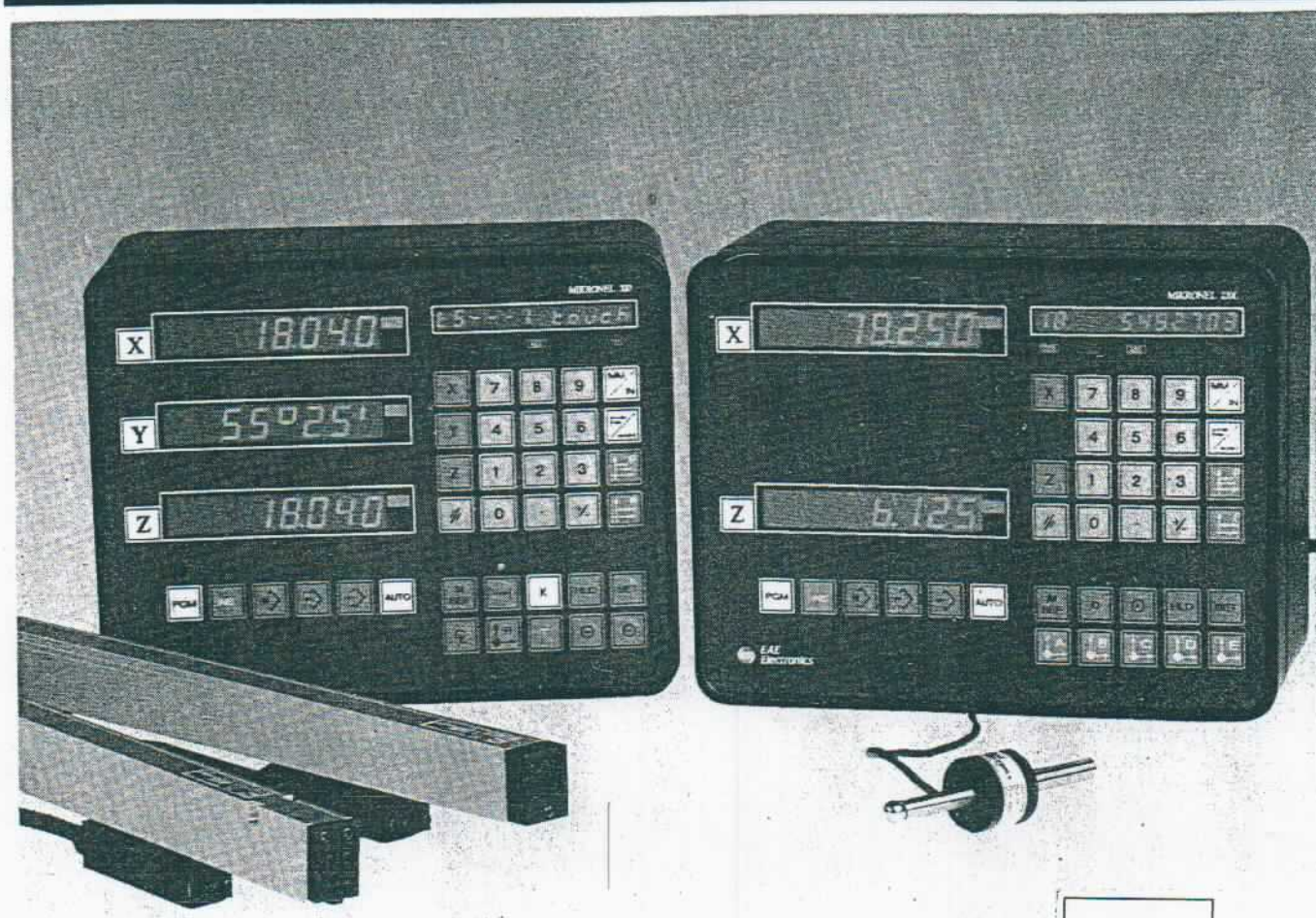
EAE Electronics

Standard Digital Read - Out Unit Users Manual



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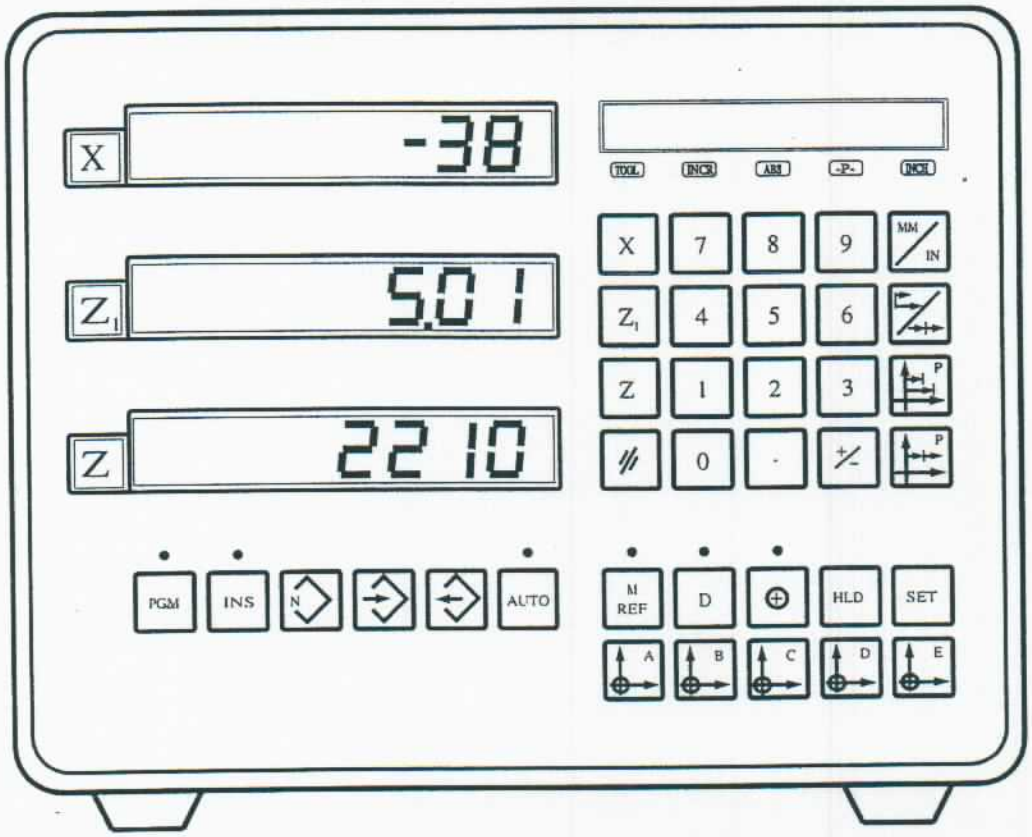
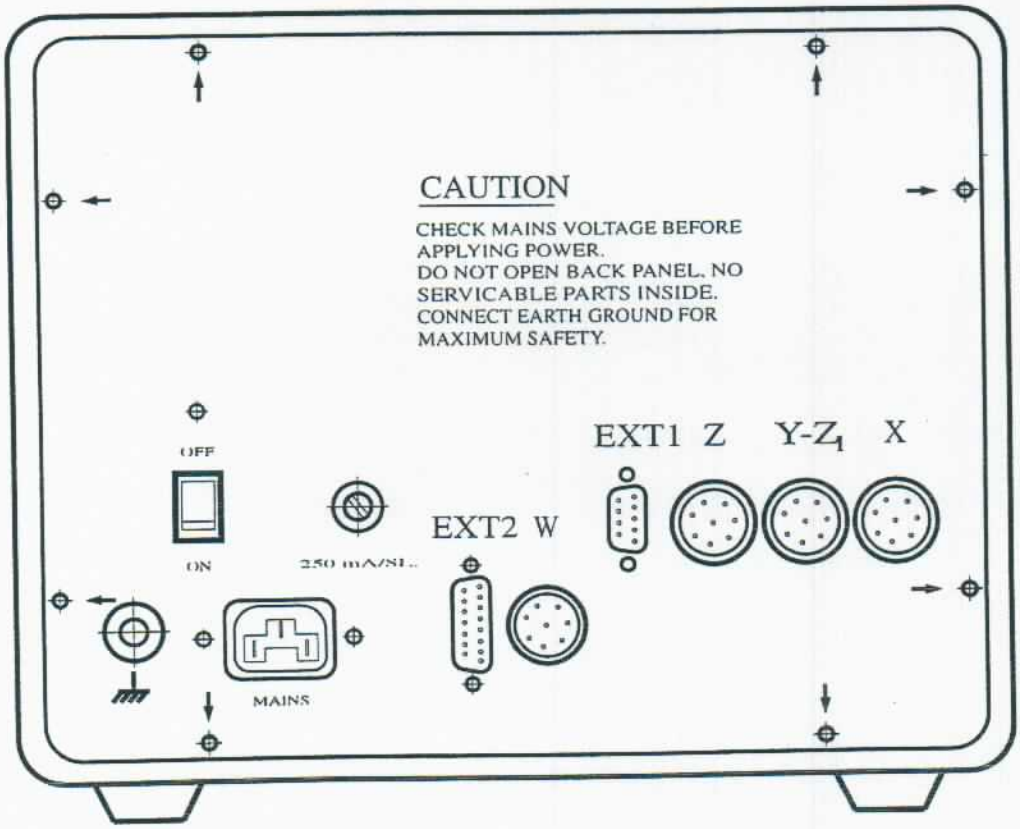




1.CONTENTS

2.-GENERAL INFORMATION ON MNEL320 USE

In this manual Micronel is abbreviated by MNEL. Use of MNEL has been sectionalised enabling one to use the appropriate section for the type of work at hand. This functional partitioning can be seen physically from the front panel layout of the unit. The front panel includes function keys and key pad, the axis displays, auxilary display, and indicators. For ease of use function keys have been grouped into three sections.

The first group including the key pad allows one to enter coordinates to axes, make absolute or incremental positioning & measurement along with conversion and setting of inch or metric units.

The second group enables one to make measurements, setup machine tool reference, enter mould shrinkage compensation, tool radius compensation, use touch probe functions, and change reference points.The third group of function keys are dedicated to programming functions.Each axis coordinate display is signed and seven digits long.The auxilary display can be thought to be the display from which all coordinates are entered to the appropriate axes. During operation, when not used for coordinate entry, on the left hand side of this display active cutting tool number is indicated to the user.When lit, round shaped indicators indicate that related fuction key is active. Indicators having inscriptions on them show system mode; for example, when in inch mode, the indicator with inch inscription will be lit. This functional partitioning of the front panel is applicable for user functions (non- administrative).The system can be set to a different mode for administration of system parameters whereby each key will have a completely different function. These two modes will be explained separately in subsequent sections.

In addition to these two user modes,for rapid diagnostics and service, there exists a third mode called the "Technician", especially designed for service personnel. This mode being only for service personnel its operation is not included in this users manual.Upon power up, MNEL320 automatically runs a self test diagnostic program. Different functional parts of the system are tested for error free operation. If an error is detected, auxilary display will bear the flashing message "Error XX", and warning buzzer will be sound. Numbers XX in the error message is the error code number. Under these circumstances axis displays will not turn on, and the user should contact our service departments.

3.- USER FUNCTIONS

User functions were briefly mentioned in the previous section. This section will explain user functions in detail.

3.1.ENTERING COORDINATES TO AXIS

All coordinate entries are made from the auxilary display. When there are repeating dimensions (eg.- periodic holes), entry from auxilary display results in minimum number of key strokes saving time and reducing probability of error.

KEYS	EXPLANATIONS
0 - 9	Desired coordinate can be entered to he right hand side of the auxilary display using the key pad.
//	Pressing this key will clear an entry.
.	Demical point is used for the fractional part of an entry. Any number of digits may be entered for the fractional part, however during transfer to an axis only the number of digits allowed by the resolution of an axis will be transferred. Different axes may have different resolutions.
+/-	May be used change sign of the number being entered (at any point during number entry). Each time this key is pressedthe sign will toggle.
X Z1 Z	Pressing appropriate axis key will transfer the number on the auxilary display to the axis display .Following this operation the number entered to the auxilary display will remain unchanged, facilitating repeated transfers to an axis or to a different axis.

3.2.-Inch/mm CONVERSION

Despite the fact that the scales used for coordinate measurement output position information in metric units, axis displays may be set to indicate in inch or mm units or convert from one set of units to the other. This is achieved through a floating point multiplication, and the position of the decimal point is automatically changed depending on units chosen.For example, an axis having a resolution of 0.01 mm will indicate 0.0004 inch when set to inch mode.

KEYS	EXPLANATIONS
MM/IN	(Inch indicator not lit.) Pressing this key will result in conversion of indicated dimensions to inches, and the inch indicator will turn off.
MM/IN	(Inch indicator lit.) Pressing this key will result in conversion of indicated inch dimensions to metric units, and the inch indicator will turn off.

3.3.- ABSOLUTE AND INCREMENTAL MEASUREMENTS

Depending on the way dimensions are given on a work piece drawing the user may require absolute, incremental or mixed measurement capability. To facilitate the user with this ability each reference coordinate system that can be set up includes an ABSolute counter, and an INCRemental counter. System parameters numbered 29,30,31 and 32 to be explained in section 4 determines the way the incremental counter is configured. Depending on parameters set, each time mode is set to incremental the incremental counter may be cleared to zero or retain its last value.

KEYS	EXPLANATIONS
	(ABS indicator lit.) Pressing this key will bring to display last incremental counter value or cleared incremental counter (depending on parameters set), and INCH indicator will be lit while ABS indicator will turn off.
	(INCR indicator lit.) Pressing this key will bring to display the absolute counter value, ABS indicator will be lit and INCR indicator will turn off.

3.4.- POSITIONING

In practice it is not easy to position a machine tool to a coordinate given on a drawing as this requires the operator to constantly remember and watch out for a multidecimal place dimension. Entering a dimension to a coordinate measurement system, and a machine tool move for zero indication on the display is an often used natural alternative for operators.

Keys having the legends  and  consecutively sets system mode to absolute and incremental positioning and enables the operator to use the zero approach method of positioning. When in ABS mode, difference between absolute measurement counter and the dimension entered to auxilary display is shown on axis display. In other words, ABS measurement counter equals the dimension entered to an axis via the auxilary display when the machine tool is moved in such a way that the axis display reads zero.

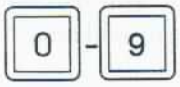
Absolute position is of no consequence in incremental mode. In this mode what matters is the distance to be traversed from present position. An important feature of this mode is that the system does not allow error accumulation. For example, if one desires to position a machine tool to four equidistant points, then this method of positioning may be used. Any possible error made in the previous positioning will be accounted and corrected in the next.

Absolute positioning :

KEYS	EXPLANATIONS
	(-P- Indicator not lit) Pressing this key will clear all coordinate axis displays, ABS indicator will be lit, and -P-indicator will start to flash.
	Absolute coordinate to be approached may be entered using the key pad.
	Pressing this key will clear an entry. .

KEYS	EXPLANATIONS
	Demical point is used for the fractional part of an entry. Any number of digits may be entered for the fractional part, however during transfer to an axis only the number of digits allowed by the resolution of an axis will be transferred. Different axises may have different resolutions.
	May be used to change sign of the number being entered (at any point during number entry). Each time this key is pressed the sign will toggle.
	Pressing the appropriate axis key will transfer the dimension entered taking into account any possible error made in previous incremental positioning. When the machine tool is moved for zero indicaton on the axis display it will have moved by the amount entered (ABS counter value is of no consequence at this time.) (These operations may be repeated as many times as desired)
	(-P- Indicator flashing) Pressing this key will end incremental positioning, the -P- indicartor will turn off, ABS indicator will turn on and ABS coordinates will be displayed.

Incremental positioning :

KEYS	EXPLANATIONS
	(-P- Indicator not lit) Pressing this key will clear axis displays, INCR indicator will be lit, and -P- indicator will start to flash
	Distance to be traversed may be entered using the key pad.
	Pressing this key will clear an entry.
	Demical point is used for the fractional part of an entry. Any number of digits may be entered for the fractional part, however during transfer to an axis only the number of digits allowed by the resolution of an axis will be transferred. Different axises may have different resolutions.
	May be used to change sign of the number being entered (at any point during number entry).Each time this key is pressed the sign will toggle.
	Pressing appropriate axis key will result in display of difference between present and previously entered dimension. (When the machine tool is moved for zero indication on the axis display the coordinate entered from auxilary display will have been reached.)

(These operations may be repeated as many times as required.)

KEYS	EXPLANATIONS
	(-P- Indicator flashing) Pressing this key will end absolute positioning, the -P- indicator will turn off and ABS coordinates will be displayed on axis displays.

While in positioning mode, to change from incremental to absolute or vice versa it is not necessary to exit the -P- mode; it is sufficient to press the appropriate incremental or absolute positioning key. To exit the -P- mode, last chosen positioning key is peressed once again.When in positioning mode, inch/mm conversion is not allowed. Inch or metric unit choice must be made before entry to the -P- mode.

3.5.- MACHINE REFERENCE

Optical measurement scales based on rulings provide incremental position information. Absolute position information can only be provided with respect to a predefined reference. If the position transducer head assembly is moved with respect to the measurement scale without the measurement system being energised this move can not be detected and accounted. To facililate re-establishment of absolute co-ordinates measurement scales include reference marks. After power down, once the system traverses this reference mark it is possible to establish absolute coordinates

3.5.1.- Machine Reference Setup

This procedure indicates to the system the position of reference mark (machine reference point) from which absolute coordinates will be measured.

KEYS	EXPLANATIONS
SET	Pressing this key will clear the auxilary display,"SEt" message will appear on auxjlary display.Should no other key be pressed for a length of time exceeding 2.5 seconds the system will return to user mode.
M REF	Pressing this key will result in indicator to flash, and "SEt rEF" will appear on the auxilary display.
X Z_1 Z	Pressing appropriate axis key will indicate to the system the axis for which reference is to be set. Chosen axis coordinates will be discarded and axis display will indicate " - - - - - - - ".

The system now awaits a traverse over the reference mark to be chosen as the machine reference point. When the system is moved across the reference mark a short buzzer will be sound and the system will return to normal mode. Procedure must be repeated for each axis.

3.5.2.- Finding Machine Reference

Machine reference point, set up with the procedure described in the previous section can be found again and again. This means that absolute coordinates can be established.

KEYS	EXPLANATIONS
M REF	Pressing this key will result in its indicator to turn on, and "Find REF" to appear for 2.5 seconds on the auxilany display. Within this time period axis choice must be made, otherwise the system will return to user mode.
X Z_1 Z	Pressing appropriate axis key will indicate to the system the axis chosen .Should no reference point be previously set to the chosen axis, then for a period of 5 seconds "not SEt" message will flash on auxilary display. If a reference point has been established, as described in section 3.5.1. chosen axis will indicate " - - - - - - - "

When the reference mark is traversed, axis display will return to normal and will be indicating the absolute coordinate being sought.

3.6.- RADIUS, DIAMETER INDICATION

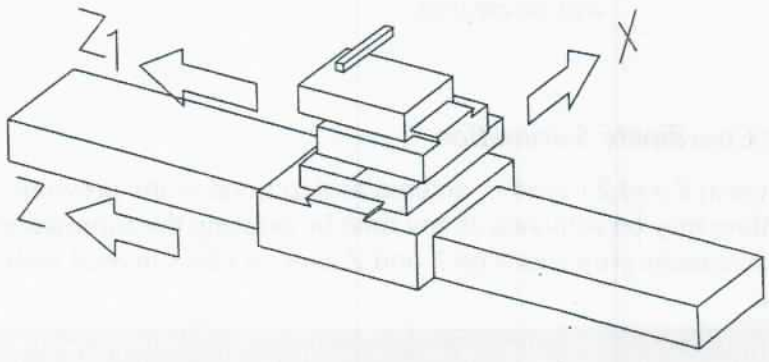
On turning machines X axis measures distance from machine center line to the tool tip. Normally this measures radius of the piece being machined. Should diameter of the part being machined is of interest, then X axis measurements must be multiplied by a factor of two. The system enables the user to choose radius or diameter indication.

KEYS	EXPLANATIONS
	(Indicator not lit -measures radius.)
D	Pressing this key will result in X axis coordinates being multiplied by a factor of two, and the diameter indicator will turn on.
	(Indicator lit-measures diameter.)
D	Pressing this key will result in radius measurement, and diameter indicator will turn off.

3.7.- CROSS SUPPORT COORDINATE SUMMATION

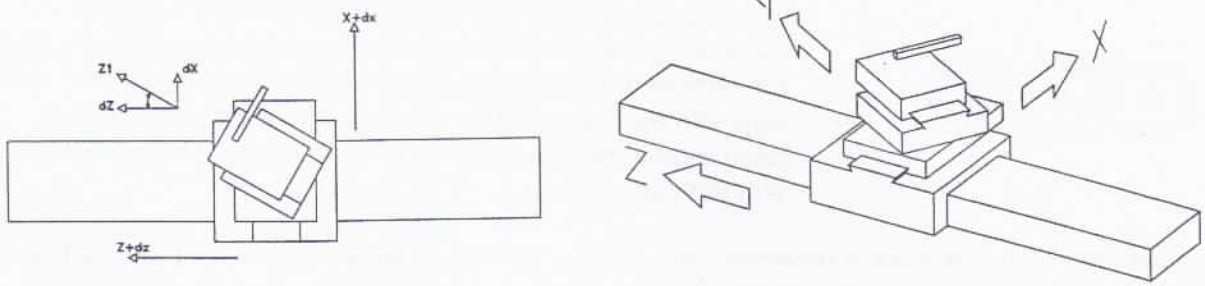
On turning machines, main support Z axis coordinates and cross support Z1 axis movements may be measured using separate rules. When thus equiped, the user may want to measure Z and Z1 separately or their sum. Standard readouts readily have this facility. However, for machining conical parts the cross support may be oriented at an angle. For such applications, through itscomputational power MNEL 320L-T provides the user with exceptional capbilities.

If the angle between Z and Z1 axes is entered to the system, Z1 axis vector components along X and Z axes may automatically be calculated and summed with these axes.



3.7.1.- Entering Cross Support Orientation Angle

For addition of projections of Z1 axis movements on X and Z axes orientation angle of the cross support (angle between Z and Z1 axes) need to be entered to the system using the following procedure.



KEYS	EXPLANATIONS.
SET	Pressing this key will result in the message "SEt" to be displayed on the auxilary display for 2.5 seconds.
⊕	Pressing this key will bring the previously entered angle to the right hand side of the auxilary display, and the key indicator will flash. Auxilary display will show zero if an angle has not been entered previously.
0 - 9	Desired angle may be entered using the key pad. Angle being entered will be flashing on the auxilary display.
//	Pressing this key will clear an entry.
.	Decimal point may be used for the fractional part, number of decimal places is limited only by display length.
+/-	May be used to change sign of the number being entered (at any point during number entry). Each time this key is pressed the sign will toggle.
SET	Pressing this key will stop flashing of auxilary display.
SET	Pressing the key a second time will return the system to user mode, summation key indicator will turn off the auxilary display will be cleared.

3.7.2.- Activating Coordinate Summation

Once the angle between Z and Z1 axes is entered as described in the previous section, coordinate summation feature may be activated at any time by pressing the summation key .When thus activated Z1 axis movements projections on X and Z axes will be summed with measurements made on these axes.

KEYS	EXPLANATIONS
	(Summation key indicator not lit.) Pressing this key will activate summation feature and its indicator will turn on.
	(Summation key indicator lit.) Pressing this key will deactivate summation feature and its indicator will turn off.

3.8.- TOOL CHANGE (reference change)

On turning machines measurement reference points need to be changed when cutting tools are changed. To facilitate this, with MNEL 320L-T 10 different coordinate systems can be set up in two groups of five. Five separate keys are dedicated for choosing reference systems, and two group use of this five keys will select 10 references. Chosen reference (1A, 2A, 1B, 2B, 1C, 2C, 1D, 2D, 1E, 2E) is constantly displayed on the left hand side of the auxilary display over the "TOOL" indicator.

KEYS	EXPLANATIONS
	Pressing this key will bring to axis displays the reference point coordinates, and on the left hand side of the auixilary display 1A will be indicated. (The same is applicable for the remaining four keys B,C,D and E.)
	Pressing the same key once again will bring to axis displays the second group of referene point coordinates, and on the left hand side of the auxilary display 2A will be indicated. (The same applies to B,C,D and E keys.) Each time the same key is pressed the group will toggle between the 1 st and 2 nd.

3.9. CALCULATOR FUNCTION

With the digital readout type M320, the need of calculating for the operator has been minimized as much as possible.However, if the operator is in need of a calculator, it has been put a calculator function to the digital readout, in order to meet this demand.It is very easy to use the calculator.It is activated by pressing the  button.The message CALC is at the left side of the auxillary display.Right side of the display is cleared.Calculator display has 7 digits.You can transfer results of the calculation to main axis displays, by pressing axis button.(Decimal point is located automatically.)

BUTTON	INSTRUCTIONS	BUTTON	INSTRUCTIONS
	=(=) gets the results		=(+) Addition
	=(-) Substraction		=(*) Multiplication
	=(/) Division		=(C) Clear
	=(-) presign		

3.10. CANCELLING OF THE AXIS INDICATOR

One of the axis indicators can be darkened in any time.This feature is to avoid scattering of attention if axis value is not being used at that time of work.The differentiations of a cancelled axis indicator are,

*In normal working nothing is seen in this indicator. But the counters of the tool goes on counting according to the signals from the axis entry.

*It is impossible to enter a value to the indicator by the keyboard if it is cancelled.

*The features like finding the middle point, measuring and finding the side points can not be used in a cancelled indicator axis.

*In case of passing to the automatic use during operating the machine, the values that had been recorded to the memory will not be used in positioning.

*It is impossible to make program on a cancelled axis indicator.It means that incremental value "zero"is entered automatically to the memory.

THE CANCELLATION OF AXIS INDICATER

KEYS	EXPLANATIONS
SET	"SET"is seen on the auxillary display for 2,5 seconds and will be off if any keys is not been pressed in this period.
X Z_1 Z	If any of the axis indicator keys are pressed in this period that axis will be cancelled and the indicator is darkened.

In reverse operation the axis indicator will open again.

4.- SYSTEM PARAMETERS

Certain parameters necessary for system operation and configuration may be set in nonvolotile system memory by the user. These are called system parameters. As mentioned earlier, during system administration front panel keys will have different functions than those indicated on them. Normally system parameters will not be changed often, thus a special key combination is used to enter this mode. This also reduces risk of accidental entry to this mode.

4.1.- CHANGING SYSTEM PARAMETERS

The following procedure will result in entry to system administration mode for modification of system parameters.

KEYS	EXPLANATIONS
MM/IN + E	These two keys must be pressed simultaneously. Press the first key, and while holding it pressed, press the second key. The auxilary display will read the message "Pr no=00", with flashing to indicate parameter number entry is to be made.
0 - 9	Using the key pad a two digit parameter number may be entered. (Digits will be shifted, rub-out key will not be active.)
SET	Pressing this key will result in X axis display showing parameter number in Pxx format, and the auxilary display will be indicating parameter value. Depending on type of parameter, parameter value may have different number of digits.
0 - 9	New parameter value may be entered using the key pad. Newly entered parameter value will be shown flashing on the right hand side of the auxilary display.

Applicable parameter values, and their functions are listed in section 4.2.

SET	Pressing this key will result in transfer of new parameter value to system memory, and parameter value indicated on auxilary display will stop flashing. Should an inappropriate paremater value be entered, the auxilary display will be showing the previous acceptable value, and parameter change will not be done.
PGM	Pressing this key will facilitate choice of a new parameter number, and the auxilary display will bear the message "Pr=00".

Above given procedure may be repeated as many times as required.

AUTO	At any point during the procedure pressing this key will result in exit to normal user mode.

4.2.- SYSTEM PARAMETER LISTING

Pr no **EXPLANATION**

00.....Adjusts RS 232 serial communication port speeds. 1200,2400,4800,9600 Baud values may be selected.

01.....Type of scale connected to X axis.

02.....Type of scale connected to Y(or Z1) axis.

03.....Type of scale connected to Z axis.

04.....Type of scale connected to W axis.

Choice of scale types for parameters 01,02,03,04 are as follows:

0- User defined measurement scale.When this option is chosen parameters 05 to 20 must be set.

1- 0.001 mm resolution scale.

2- 0.005 mm resolution scale.

3- 0.010 mm resolution scale.

4- 0.050 mm resolution scale.

5- 0.100 mm resolution scale.

6- 0.500 mm resolution scale.

05.....X axis mm mode decimal point place.

06.....Y(Z1) axis mm mode decimal point place.

07.....Z axis mm mode decimal point place.

08.....W axis mm mode decimal point place.

09.....X axis inch mode decimal point place.

10.....Y(Z1)axis inch mode decimal point place.

11.....Z axis inch mode decimal point place.

12.....W axis inch mode decimal point place.

Parameters numbered 05 to 12 may have the value 0 to 5. Value indicates position of decimal point. For these parameters to be effective type of scale (parameters 01,02,03,04) must have zero value.

13.....X axis mm mode multiplication factor.

14.....Y(Z1)axis mm mode multiplication factor.

15.....Z axis mm mode multiplication factor.

16.....W axis mm mode multiplication factor.

17.....X axis inch mode multiplication factor.

18.....Y(Z1)axis inch mode multiplication factor.

19.....Z axis inch mode multiplication factor.

20.....W axis inch mode multiplication factor.

For parameters numbered 13 to 20, allowable multiplication factor paramater value is from zero to 15.99999999, maximum number of digits is 10.

Pr no **EXPLANATION**

21.....X axis machine tool correction factor.

22.....Y(Z1) axis machine tool correction factor.

23.....Z axis machine tool correction factor.

24.....W axis machine tool correction factor.

Parameters numbered 21 to 24 will require correction factor in micro meters/meter. Any value between zero and +/- 99999 may be entered.

25.....X axis count direction.

26.....Y(Z1) axis count direction.

27.....Z axis count direction.

28.....W axis count direction.

Increasing/decreasing count direction is set independently of the way measurement scales are attached to the machine tool. Parameters numbered 25 to 28 may either have the value zero or one

29.....Type of use of X axis incremental counter.

30.....Type of use of Y(Z1)axis incremental counter.

31.....Type of use of Z axis incremental counter.

32.....Type of use of W axis incremental counter.

For parameters 29 to 32 when parameter value is set to zero , upon entry to incremental mode last count value will be brought to axis displays. When the parameter value is set to 1, each time incremental mode is entered the counter will be cleared and displayed.

33.....Tool touch direction indicator

Parameter value zero: Indicator on the left hand side of axis displays. Parameter value one : Shifting point on axis displays.

34.....X axis counter type.

35.....Y(Z1) axis counter type.

36.....Z axis counter type.

37.....W axis counter type.

These parameters set counter type and are used when an encoder of the rotary type is connected to the system. Possible parameter values are;

0- Linear scale

1- Angle display (xxx degrees)

2- Angle display (xxx degrees,xx minutes)

3- Angle display (xxx degrees,xx minutes ,xx seconds)

4- Angle display (xxx.x degrees)

5- Angle display (xxx.xx degrees)

6- Angle display (xxx.xxx degrees)

38.....Duration of buzzer sound when a key is pressed. Parameter may have any value between zero and 99 milli seconds.

Pr no	EXPLANATION
39	Sets duration of relay contact closure for electro-erosion machines. Parameter values between zero and 255 (corresponding to 10 milli seconds) may be entered.
40	Z1 display ON/OFF parameter on + mode for lathe type .Tool selection in program mode. 0: OFF 1: ON

4.3. COLD START

In case of a system malfunction and repair or random administration of system parameters normal operation may be disrupted. A procedure termed "Cold Start" is included in system functions to return initially set default values of system parameters, and to enable normal functioning. At cold start programme memory will be cleared.

KEYS

EXPLANATIONS

These two keys must be pressed simultaneously. Press the first key, and while holding it pressed, press the second key. Axis displays will be cleared, auxilary display will turn on, and system will be reset.

Default values of system parameters following a cold start are as follows:

Parameter no:	Initial value
00	1200
01	2
02	2
03	2
04	2
05	2
06	2
07	2
08	2
09	4
10	4
11	4
12	4
13	1
14	1
15	1
16	1
17	3,93700787
18	3,93700787

Parameter no:	Initial value
19	3,93700787
20	3,93700787
21	0
22	0
23	0
24	0
25	0
26	0
27	0
28	0
29	0
30	0
31	0
32	0
33	1
34	0
35	0
36	0
37	0
38	4
39	100
40	1

OPTIONS

OPSIYON A

OPTION A

1.PROGRAMMING (PGM)

MNEL 320-T includes 100 blocks of memory each of which is wide enough to contain coordinates of all axes. Programming involves writing of coordinates to memory, and machining by recalling blocks in sequence.The group of keys located on the lower left hand side of the front panel are all dedicated to programming functions. The first key on the very left hand side of this group is used to enter and exit programme mode. When in programme mode, indicator on this key will be lit.There are two ways of entering coordinates to programme memory. In the first, coordinates may be entered from a drawing using the key pad.In the second, called the tEACH-In mode, coordinates of a work piece on the machine tool may be entered to memory by a single key stroke. If desired, while machining, successive blocks of memory will automatically be recalled from memory when coordinates of the previous block is reached.

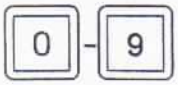
1.1.- ENTERING COORDINATES TO MEMORY VIA KEYBOARD

In this method, coordinates are entered to axis displays using the key pad and they are transferred to system memory. Nature of dimension -incremental or absolute-may also be specified.

KEYS	EXPLANATIONS
	(Indicator above the key not lit.) Pressing this key will result in entry to programme mode, the key indicator will turn on, and the message "Pro" will be given on the auxilary display.

If no other key relating to programming is pressed within 2.5 seconds the system will return to normal user mode.

	Pressing this key will result in display of block number on the auxilary display. "bl no=00"will be indicated and "00" will flash.
	Using the key pad two digit block number may be entered. (Since digits are shifted rub-out key will not be active, and number of digits that may be entered is not limited.)
	Pressing this key will result in display of block number on the left hand side of the auxilary display while on the right hand side "dELEtE" message will be given. When this key is pressed the coordinates within that memory block will be transferred to axis display, and the indicators on the right hand side of axis display will indicate type of dimension; measurement is incremental if the indicator is lit.
	(Key indicator not lit.) This is the insert key. When pressed its indicator will turn on and dimensions to be entered will not overwrite ; all subsequent blocks of data will be shifted one block.

KEYS	EXPLANATIONS
	(Key indicator lit.) Pressing the key will turn off the key indicator , and coordinate to be entered will over write data within the block indicated on the auxilary display.
	Desired coordinate can be entered to the right hand side of the auxilary display using the key pad.
	Pressing this key will clear an entry. If the key is pressed while "dELEtE" message is on the auxilary display one block will be cleared and subsequent blocks will be shifted up.
	Demical point is used for the fractional part of an entry. Any number of digits may be entered for the fractional part, however during transfer to an axis only the number of digits allowed by the resolution of an axis will be transferred. Different axes may have different resolutions.
	May be used to change sign of the number being entered (at any point during number entry). Each time this key is pressed the sign will toggle.
	(INCR indicator not lit.) Upon pressing this key INCR indicator will be lit to remind that this measurement, will be recorded as an incremental measurement.
	(INCR indicator lit.) Pressing this key will turn INCR indicator off, measurement to be recorded is absolute.
	Pressing the appropriate axis key will transfer coordinate entered to the auxilary display. Axis display INCR/ABS indicator will also be adjusted at this time.
	This is the "enter" key. When pressed dimensions indicated on axis displays will be written to the block indicated on the auxilary display.

Following this operation block number indicated will automatically be incremented and coordinates within the block will be transferred to axis displays.These operations may be repeated untill all data is recorded.

	Pressing this key will fetch the next block of data.
	Pressing this key will fetch the previous block of data.

Using these keys, memory may be inspected, while doing this if coordinates are entered to axis displays this will not be transferred to memory. These operations may be repeated as many times as required.

1.2.- ENTERING COORDINATES IN TEACH MODE

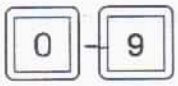
As opposed to entering dimensions from a technical drawing, in this method of entry dimensions are entered from an actual work piece. In this process axis displays will be showing coordinates, and when the desired position is reached with a single key stroke dimensions being displayed may be entered to memory.

KEYS **EXPLANATIONS**

(Indicator above the key not lit.)
Pressing this key will result in entry to programme mode, the key indicator will turn on, and the message "Pro" will be given on the auxilary display.

If no other key relating to programming is pressed within 2.5 seconds the system will return to normal user mode.

Pressing this key will result in display of block number on the auxilary display. "bl no=00" will be indicated and "00" will flash.



Using the key pad two digit block number may be entered. (Since digits are shifted rub-out key will not be active, and number of digits that may be entered is not limited.)

Pressing this key will result in display of block number on the left hand side of the auxilary display while on the right hand side "dELEtE" message will be given. When this key is pressed the coordinates within that memory block will be transferred to axis display, and the indicators on the right hand side of axis display will indicate type of dimension; messurement is incremental if the indicator is lit.

When this key is pressed, on the right hand side of auxilary display the message "tEACh-In" will be displayed, and the axis displays will be showing actual coordinates.

On the work piece the machine tool may be positioned while axis displays are indicating coordinates.

(Key indicator not lit.)
This is the insert key. When pressed its indicator will turn on and dimensions to be entered will not overwrite ; all subsequent blocks of data will be shifted one block.

(Key indicator lit.)
Pressing the key will turn off the key indicator , and coordinate to be entered will over write data within the block indicated on the auxilary display.

This is the "enter" key. When pressed dimensions indicated on axis displays will be written to block indicated on the auxilary display. Following this operation block number indicated will automatically be incremented and coordinates within the block will be transferred to axis displays.

1.3.- USING PROGRAMME MEMORY

Dimensions entered to system memory using one of the previously explained methods may be used for positioning the machine tool. Positioning procedure is very similar to the manual operation described in section 3.4.of MNEL Users Manual. For all positioning operations the machine tool is moved for a null axis display indication. In positioning from memory, next block of memory may if desired be automatically recalled. For this the system must first be set to "AUTO" mode, during machine use the moment all axis displays reaches zero the next block of data will be recalled from memory.

1.3.1.- Maunal Use

In manual use, coordinates entered in memory are recalled to axis displays, positioning is made by machine tool move for null indication on axes used. Following the required operation the user recalls the next block. Programme mode, and memory block is selected as previously explained.

KEYS	EXPLANATIONS
	When this key is pressed -P- indicator will flash signalling entry into positioning mode. On the right hand side of auxilary display "rEAd" message will be given, and the axis displays will be showing distances to be traversed from present position.

Each time this key is pressed next memory block contents will be fetched to axis displays and memory block number indicated on auxilary display will be incremented. A particular block may be recalled by entering block number.

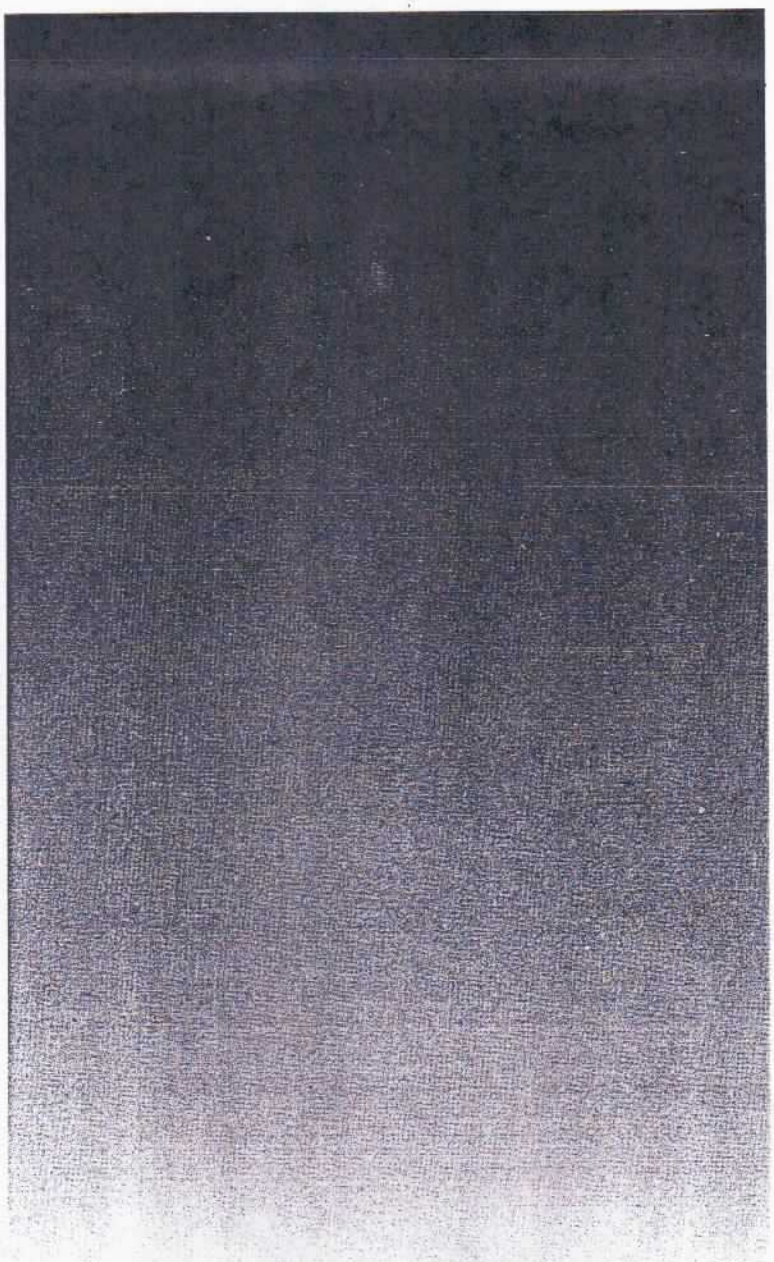
1.3.2.- Automatic Use

This method of use is the same as previously explained in section 1.3.1., except that consecutive blocks are automatically fetched from programme memory. For this,necessary condition is null indication on all axis displays. Programme mode, and memory block is selected as previously explained.

KEYS	EXPLANATIONS
	When this key is pressed -P- indicator will flash signalling entry into positioning mode. On the right hand side of auxilary display "rEAd" message will be given, and the axis displays will be showing distances to be traversed from present position.
	Pressing this key will activate AUTO mode, and the key indicator will be lit.

Each time the machine tool is moved for a null indication on all axes, programme block number will automatically increment and axis displays will contain necessary positioning information. When the programme memory contains no other positioning data system will automatically exit from positioning mode.

	When this key is pressed its indicator will turn off and system will return to normal user mode.



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