HEIDENHAIN

Operating Instructions

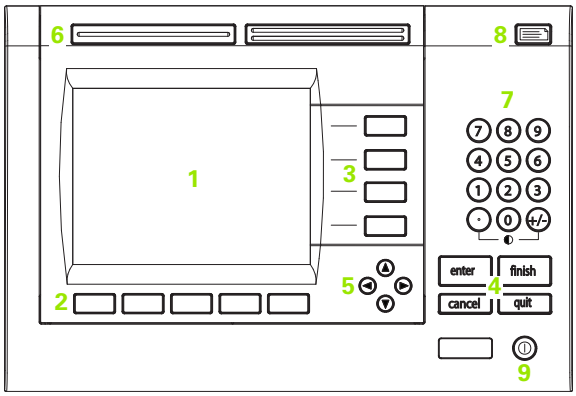
ND 1200R
Radial

Software Version
2.8.x

English (en)
6/2013

ND 1200R Introduction

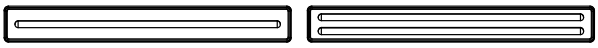
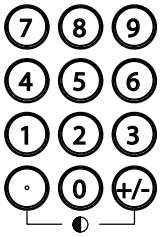
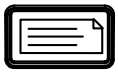
1 LCD screen
2 Soft keys
3 Axis keys
4 Command keys
5 Arrow keys
6 Wide keys
7 Numeric keypad
8 Send key
9 LCD On/Off key



ND 1200R panel keys

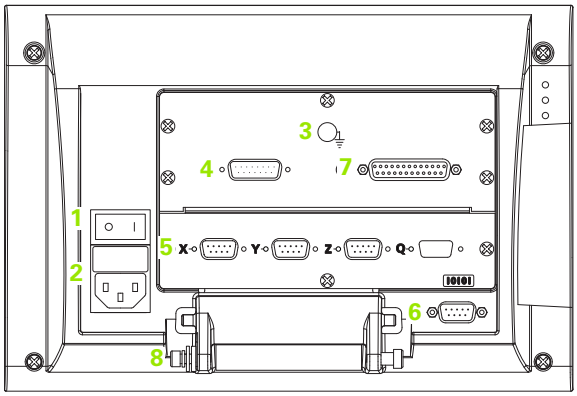
Panel keys are used to enter target position coordinates, send data via RS-232 and USB ports and configure operational parameters.

Panel function key	Panel key
Soft keys: Functions change in support of the activities displayed on the LCD.	
Axis keys: used to enter target positions.	
Command keys: Control target and data entry processes.	enter finish cancel quit
Arrow keys: Used to scroll through lists and navigate menus and setup screen data fields.	

Panel function key	Panel key
Wide keys: Two programmable Wide keys are used to perform frequently used functions. These keys can easily be located by touch without taking your eyes off the part. By default the left fast track key is assigned the SEND2 function and the right is assigned the ZERO2 function. Users can program either wide key as described later in the **Hotkeys** portion of Chapter 2: Installation, Setup and Specifications.	
Numeric keypad: Used to enter numeric data. Additionally, the **decimal point key and +/- key** are used to adjust the contrast of the LCD display.	
Send key: Used to transmit target data to a computer or USB printer.	
LCD On/Off key: Press the LCD on/off button to turn the LCD display off without removing power from the ND 1200R. Press the button a second time to restore the LCD display. Additionally, the LCD On/Off key can be used to clear target data, datums and skews.	

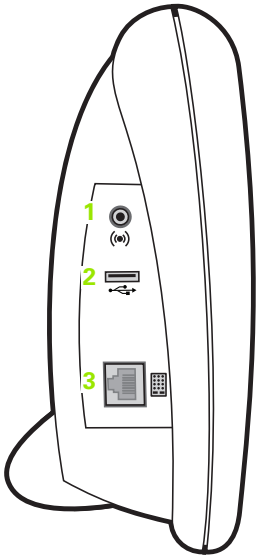
ND 1200R rear panel

1 Power switch
2 Power cord connector and fuse holder
3 Power ground access
4 HEIDENHAIN 15 pin universal touch probe sensor
5 Measurement axis connectors
6 RS-232 serial port connector
7 Not supported in the ND 1200R
8 Tilt base mechanical tightness adjustment



ND 1200R side panel

1 Speaker/headset jack
2 USB Type A connector
3 RJ-45 Foot switch/hand switch/keypad connector



Information contained in this manual

This User's manual covers the operation, installation, setup and specifications of the ND 1200R. Operating information is contained in chapter 1. Installation, setup instructions and specifications are contained in chapter 2.

Fonts used in this manual

The following fonts are used to indicate operator controls or to show emphasis:

- Operator controls - SOFT KEYS and other PANEL KEYS are shown in upper case.
- Emphasis - **Items of special interest** or **concepts** that are emphasized to the user are shown in bold type.

Showing sequences of key presses

The ND 1200R user performs sequences of soft key and panel key presses to complete tasks. These sequences are indicated using text as shown in the following example:

- Press the MENU soft key, press the DATUM soft key and then press the ZERO soft key is sometimes abbreviated as:
- Press MENU>DATUM>ZERO

Symbols within notes

Notes are marked with symbols on the left indicating the type, or potential severity of the information.

General Information

This is additional or supplementary information about an activity or concept.

Warning

This warns of a situation or condition that could lead to measurement errors, equipment malfunction or equipment damage. Do not proceed until the message is read and understood.

Caution - Risk of electric shock

This warns of a situation or condition that could lead to electrical shock and to personal injury or death. Do not proceed until the message is read and understood.

Safety considerations

General accepted safety precautions must be followed when operating the system. Failure to observe these precautions could result in damage to the equipment, or injury to personnel. It is understood that safety rules within individual companies vary. If a conflict exists between the material contained in this manual and the rules of a company using this system, the more stringent rules should take precedence.

The ND 1200R is equipped with a **3-wire** power plug that includes a separate ground connection. Always connect the power plug to a 3-wire grounded outlet. Use of 2-wire power plug adapters or any other connection accessories that remove the third grounded connection create a safety hazard and should not be permitted.

Unplug the ND 1200R from the power outlet and seek the assistance of a qualified service technician if:

- The power cord is frayed or damaged or the power plug is damaged
- Liquid is spilled or splashed onto the enclosure
- The ND 1200R has been dropped or the exterior has been damaged
- The ND 1200R exhibits degraded performance or indicates a need for service some other way

ND 1200R measurement axes

The ND 1200R DRO can display 2 or 3 axes depending on the model purchased. DRO screen images used throughout this manual show different numbers of axes and are for illustration only.

Software version

The software version is shown in the About setup screen discussed later in chapter 2.

Cleaning

Use only a cloth dampened with water and a mild detergent for cleaning the exterior surfaces. Never use abrasive cleaners, and never use strong detergents or solvents. Only dampen the cloth, do not use a cleaning cloth that is dripping wet.

1 Operation

2 Installation, Setup and Specifications

1

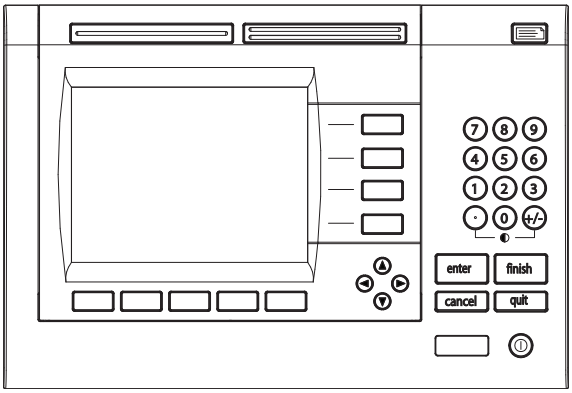
Operation

1.1 ND 1200R Overview

The ND 1200R is an advanced digital readout (DRO) system for radial drilling machines using analog or TTL encoders. The system allows the operator to directly enter either cartesian or polar coordinates for target positions. This alleviates the requirement of either pre-drilling holes or a previous operation of marking out the holes on an expensive machine elsewhere. The system defaults to cartesian coordinates when entering target positions and polar coordinates when navigating to a target.

The following functions are available in the ND 1200R:

- Reference mark evaluations for distance-coded and single reference encoders
- Linear error correction
- Multilingual LCD user interface: language is selected by the user
- Soft key functions under LCD change to support different user activities
- Arrow keys for easy navigation of lists and menus
- Skew compensation for part alignment, eliminating the need for time-consuming fixturing
- Absolute and incremental targeting
- Axis zero for establishing a datum

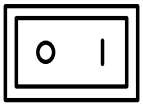


ND 1200R Front panel

- Number keypad with:
  - Number keys for data entry
  - Decimal point and +/- keys for data entry and LCD screen contrast adjustment
- User-defined hot keys that program panel and optional remote keys to initiate commonly used functions.
- User-defined programs to save target sequences
- Direct entry of cartesian or polar target coordinates
- User-defined drilling patterns for:
  - Frame pattern
  - Rectangular pattern
  - Line pattern
  - Circle pattern
- Speaker jack outputs for quiet or noisy environments
- Optional remote foot switch and keypad facilitate measurement when the user is not close to the front panel

1.2 Basic Functions of the ND 1200R

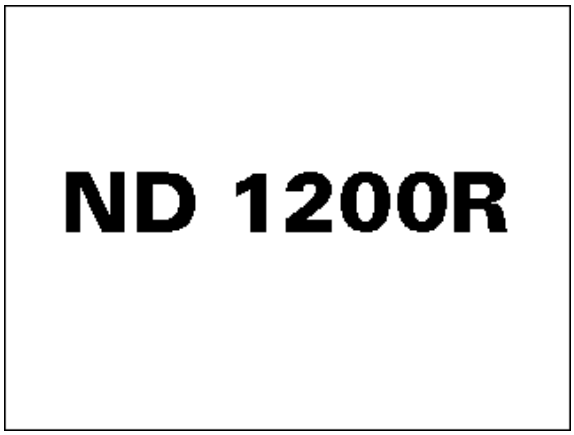
Switching on the ND 1200R



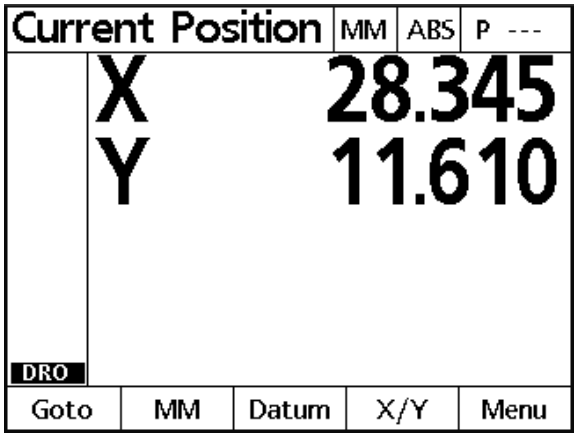
Switch on the ND 1200R. The POWER switch is located on the rear of the enclosure. After switching the power on, or after a power failure, the power-up screen will be displayed.

Press the FINISH key to advance from the power-up screen to the DRO.

Your ND 1200R is now ready for operation and is in the Current Position operating mode. Encoder position values will be displayed for all axes.



Power-up screen



DRO screen

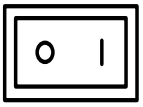
Establishing a repeatable machine zero

If your ND 1200R was configured to establish a machine zero upon power-up, a message will be displayed asking you to cross reference marks or enter hard-stop axis reference positions. The machine zero is used by the ND 1200R to apply error correction data. To establish a repeatable machine zero you must either:

- Move the stage to have encoder reference mark crossings recognized on each axis **or**
- move the stage to the hard-stop reference position and press ENTER on each axis when no encoder reference marks are present.

If the requirement to cross reference marks is bypassed by pressing the CANCEL soft key, error correction data that might be stored in your ND 1200R **will not be applied**.

Switching off the ND 1200R



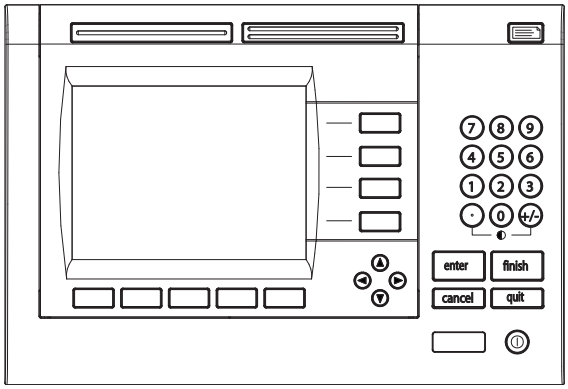
Switch the ND 1200R off. The parameter settings, error compensation tables and recorded programs that have been saved during operation will be retained in memory.

Panel key descriptions

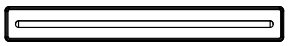
Descriptions of panel key functions are provided in the following pages for COMMAND, AXIS, WIDE, SEND, LCD ON/OFF and ARROW keys. Soft key functions are also described later in the next section as part of screen and soft key layout descriptions.

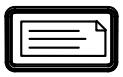
Command keys	Function
enter	**Enter data:** Press the enter key to enter values into configuration fields. Pressing the enter key indicates that data in a field is ready for use.
finish	**Finish a target entry:** Press the finish key to complete a target entry or select the next target in a program.
cancel	**Delete data or target:** Press the cancel key to delete data in configuration fields or any highlighted target from the target list.
quit	**Quit current activity:** Press the quit key to abandon the current task and return to the DRO screen or to exit the target list.

AXIS keys	Function
—	**Enter a target:** Press an Axis key to enter target position coordinates.
—	
—	

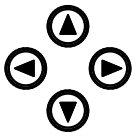


ND 1200R Panel keys

WIDE keys	Function
	**Left frequently used function:** Press the left WIDE key to initiate the function programmed for this key. The factory default function for this key is SEND2. Refer to "Hot key assignments" on page 78 for additional information.
	**Right frequently used function:** Press the right WIDE key to initiate the function programmed for this key. The factory default function for this key is ZERO2. Refer to "Hot key assignments" on page 78 for additional information.

SEND key	Function
	**Transmit target data:** Press the SEND key to transmit target data to a computer or a USB printer.

LCD ON/OFF key	Function
	**Turn the LCD off or clear data:** Press the LCD ON/OFF key to toggle between LCD on and LCD off, or to clear target data, datums and part alignments (skews).

ARROW keys	Function
	Navigate menus and setup screen data fields.

LCD screen and soft key layout

ND 1200R LCD screens display information in one of three operating modes:

- **DRO mode** displays current positions of axes
- **Distance from target mode** displays the distance from a target position
- **Setup mode** displays ND 1200R setup screens

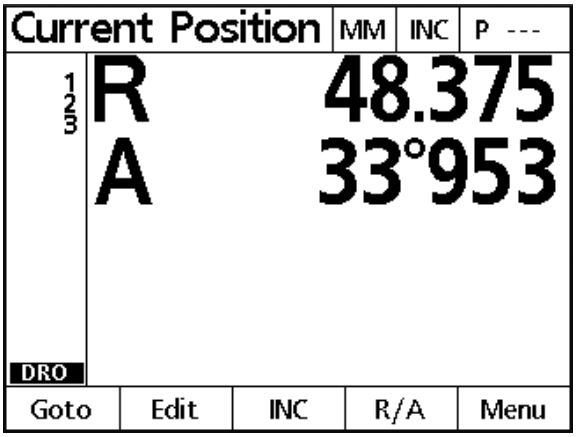
Soft keys change to support activities shown on the screens.

Setup screens and soft keys are described in Chapter 2: Installation, Setup and Specifications.

DRO mode screen and soft keys

The DRO screen shows:

- List of targets on the left side
- Unit of measure, current datum and program number in the upper right corner
- The current positions of all axes
- Part alignment status: a small rectangle over the axis letter indicates that the part is aligned to a measurement axis (a skew was performed)
- Soft key functions for target selection, unit of measure, datuming, cartesian or polar coordinates and menus



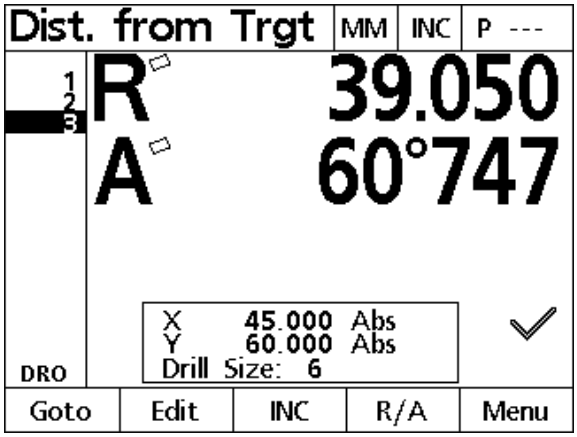
DRO screen showing current axis positions

DRO soft keys	Function
Goto	Press the GOTO soft key to select a target to navigate to.
MM or IN	Toggles between millimeters and inches units of measure. The current unit of measure is displayed in the upper right corner of the screen.
Datum	Press the datum soft key to probe, zero, move or skew a datum.
R/A or X/Y	Toggles between cartesian and polar coordinates displayed on the LCD screen.
Menu	Press the MENU soft key to access program, datum, pattern and setup menus.

Distance from target mode screen and soft keys

The Distance from target screen shows:

- List of targets on the left side
- Unit of measure, current datum and program in the upper right corner
- The the distance from a target position
- Part alignment status: a small rectangle over the axis letter indicates that the part is aligned to a measurement axis (a skew was performed)
- Soft key functions for target selection, editing a target, absolute or incremental distance selection, cartesian or polar coordinates selection and menu access



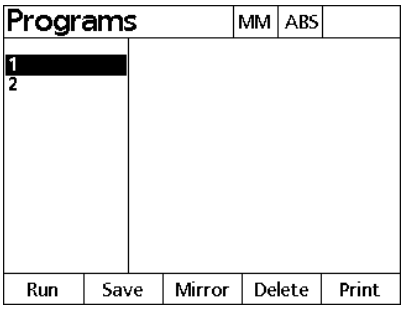
Distance from target screen showing the distance from the current position to the target position

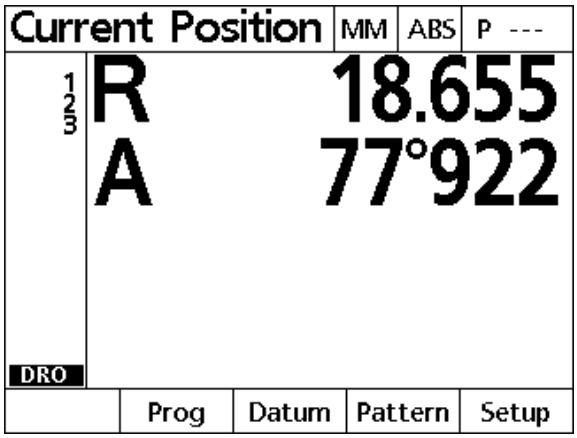
DRO soft keys	Function
Goto	Press the GOTO soft key to select a target to navigate to.
Edit	Press the EDIT soft key to access the target editing screen and edit the coordinates of the selected target.
INC or ABS	Toggles between incremental and absolute distances.
R/A or X/Y	Toggles between cartesian and polar coordinates.
Menu	Press the MENU soft key to access program, datum, pattern and setup menus.

ND 1200R Menus

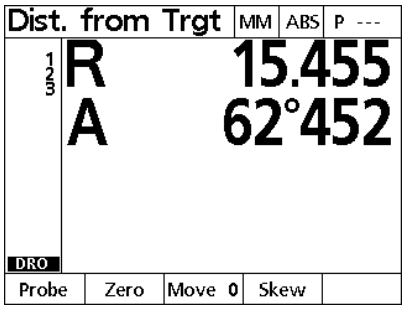
Menu

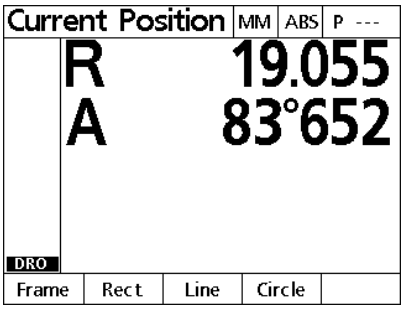
Press the MENU soft key to display menu titles over the soft keys at the bottom of the LCD screen. Press a menu soft key to display the corresponding menu screen. Menus include:

PROGRAMS menu	PROGRAMS functions
	Press the PROG soft key to display the PROGRAMS screen and soft keys for program functions. Soft keys include:
Run	Press the RUN soft key to play a program of recorded target positions.
Save	Press the SAVE soft key to save a program that can be played back later.
Mirror	Press the MIRROR soft key to mirror and run a program.
Delete	Press the DELETE soft key to delete the selected program.
Print	Press the PRINT soft key to transmit a program to a computer or a USB printer.

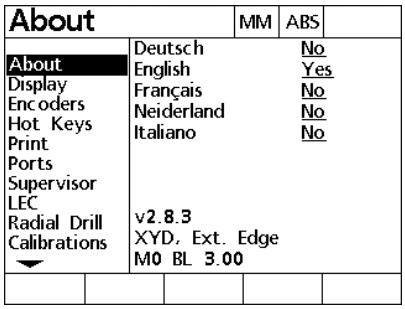


Menu titles are displayed over soft keys at the bottom of the LCD screen

DATUM menu	DATUM functions
	Press the DATUM soft key to display soft key selections for zeroing, moving and skewing the datum. Soft keys include:
Probe	Press the PROBE soft key to enter the probe diameter using the numeric keypad.
Zero	Press the ZERO soft key to select an axis, axes or hole for zeroing the datum.
Move 0	Press the MOVE 0 soft key to move the datum to a new location.
Skew	Press the SKEW soft key to compensate electronically for non-square part alignment on the primary axis.

PATTERN menu	PATTERN functions
	Press the PATTERN soft key to select a drilling pattern. Soft keys include:
Frame	Press the FRAME soft key to enter the parameters to define a frame drilling pattern. Refer to "Frame pattern" on page 39
Rect	Press the RECT soft key to enter the parameters to define a rectangle drilling pattern. Refer to "Rectangle pattern" on page 40
Line	Press the LINE soft key to enter the parameters to define a line drilling pattern. Refer to "Line pattern" on page 41
Circle	Press the CIRCLE soft key to enter parameters to define a circle drilling pattern. Refer to "Circle pattern" on page 42

SETUP menu	SETUP functions



Press the SETUP menu soft key to display the collection of SETUP screens used to configure the ND 1200R. Use of the setup menu is explained in Chapter 2: Installation, Setup and Specifications.

Access to setup menu configuration data fields is password restricted to supervisors and other technically qualified personnel. Configuration mistakes can result in serious measurement errors.

1.3 Preparing to drill

Power-up the ND 1200R

- Switch on the ND 1200R. The POWER switch is located on the rear of the enclosure. After switching the power on, or after a power failure, the power-up screen will be displayed. See "Switching on the ND 1200R" on page 14.
- Press the FINISH key to advance from the power-up screen to the DRO.

If your ND 1200R was configured to establish a machine zero upon powering up, a message will be displayed asking you to cross reference marks or specify axis references manually.

Establish machine zero

A repeatable machine zero is required for the DRO to apply the calibration chart to the machine geometry correctly.

It is not recommended to use the machine without active calibration. This would lead to unknown position errors.

Usually the calibration is based on referencing via reference marks on the encoders. To establish the machine zero after power-up:

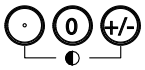
- Move the stage to have the reference mark crossings recognized on each axis.

If the machine zero is determined via hard stops:

- Move the stage to the hard-stop reference position and press ENTER on each axis.

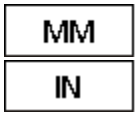
Adjust LCD screen contrast

If necessary, adjust the LCD screen contrast using the decimal point and +/- keys located on the numeric keypad.



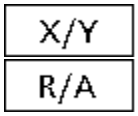
- Press the DECIMAL POINT key to increase the contrast.
- Press the +/- key to decrease the contrast.

Select unit of linear measure



- Press the MM or IN soft key to toggle between millimeters and inches.

Select a coordinate system



- Press the X/Y or R/A key to toggle between cartesian and polar coordinate systems.

Probing a position

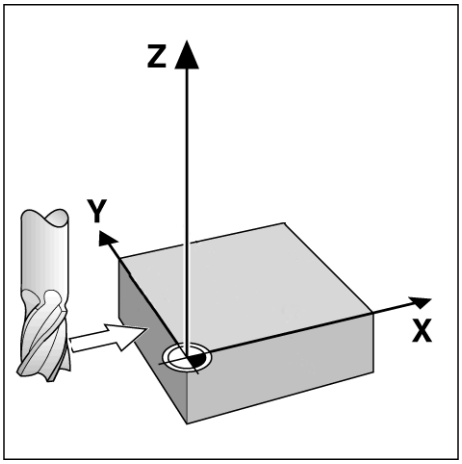
A position can be probed with a hard probe or a touch probe.

To probe a point with a hard probe:

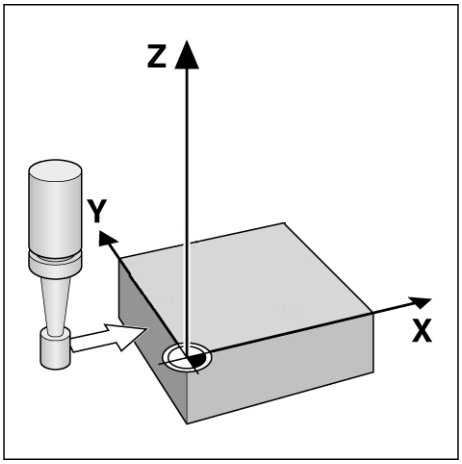
- Touch the edge of the workpiece with the probe.
- Press the ENTER key.
- Enter the probe diameter.
- Press the ARROW key that indicates the probe compensation direction.

To probe a point with a touch probe:

- Touch the edge of the workpiece with the probe. The point and the direction of probing will be entered automatically.



Probing a position with a hard probe



Probing a position with a touch probe

Select a probe diameter

A probe is required to zero the axes on a workpiece. The diameter of the probe can be adjusted. This is needed to compensate for the offset of the part from the edge of the probe being used.This diameter is either the diameter of the touch probe or hard probe being used.

To assign a probe diameter:

- Press the DATUM soft key.
- Press the PROBE soft key.
- Enter the probe size.
- Press the FINISH key.

Aligning the part to an axis

Accurate drilling requires the part to be perfectly aligned along an axis. Misaligned parts result in targeting errors. Use the SKEW function to convert machine coordinates to part coordinates and compensate for part misalignment. Perform a skew each time a new part is mounted.

Measure a skew line by probing a straight edge of the part on a major measurement axis or by probing two or more pre-drilled holes.

The skew alignment edge or line must be oriented within 45 degrees of the measurement axis.

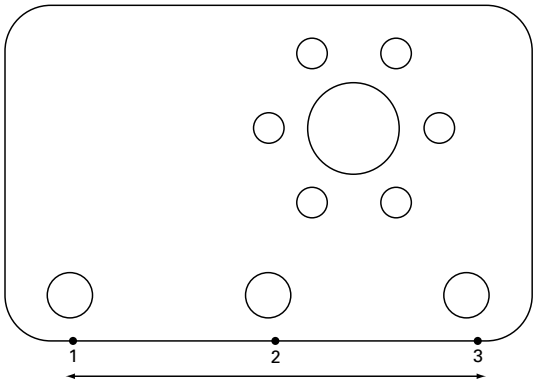
Aligning a part edge to an axis

To align a part edge to an axis:

- Align the part on the stage.
- Press DATUM>SKEW.
- Probe a minimum of two points along a part edge. In the example shown here, the part is aligned to the X-axis by probing three points along the bottom edge of the part.
- Press the FINISH key.

The part could alternately have been aligned along a vertical edge to the Y-axis.

The orientation of the cartesian coordinate system depends on the type of machine. It can be changed by the supervisor (password required).



Three points are probed to align the bottom edge of a part to the X-axis

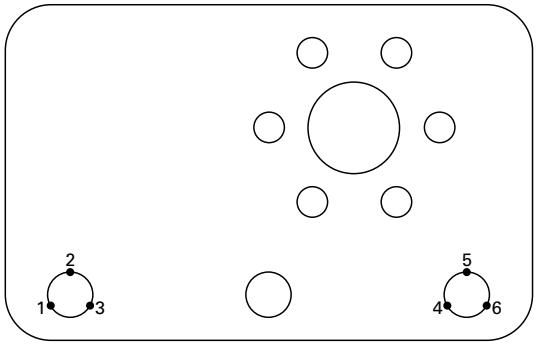
Aligning a pair of holes to an axis

There are certain times when the part needs to be aligned on the center of two pre-drilled holes.

To align a pair of holes to an axis:

- Align the part on the stage.
- Press DATUM>SKEW>HOLE.
- Probe a minimum of three points around the edge of the first hole to be used in the skew.
- Press the FINISH key to complete the first hole measurement.
- Press the HOLE soft key.
- Probe a minimum of three points around the edge of the second hole to be used in the skew.
- Press the FINISH key to complete the second hole measurement.
- Press the FINISH key to complete the skew.

Distributing the probed points evenly around the circumference of the hole will provide a more accurate placement for the center of the hole.



Three points are probed for each hole to align the center of the holes with the X-axis

Establish a datum

A datum can be created from a probed point, the center point of a probed hole or a point created from the intersection of the skew alignment line and another line perpendicular to the skew alignment line.

Setting a datum from a probed point

To set the datum from a probed point:

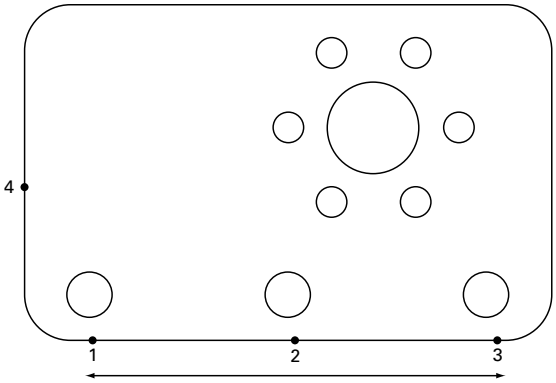
- Press DATUM>ZERO>XY.
- Probe the desired location of the datum.

Setting a datum from a skew line

The first point of a skew line is automatically set as the datum. The datum is most commonly created from a point that is the intersection of the skew alignment line and a second part edge line.

To set the datum from a skew line:

- Perform a skew alignment.
- Press DATUM>ZERO.
- Press the soft key for the axis to zero along (the same axis used for the skew line).
- Probe a point on the part edge perpendicular to the skew line. The datum is now set to the intersection of the skew alignment line and the probed part edge.



A skew is performed along the bottom and a point is probed on the side perpendicular to the skew line

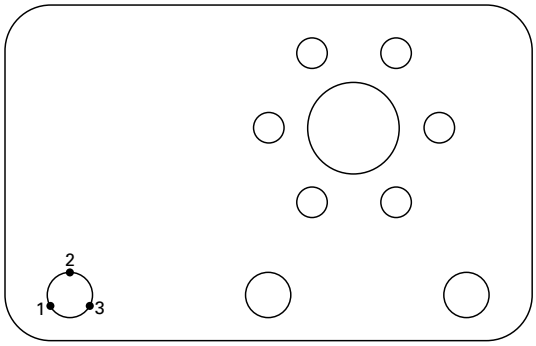
Setting a datum on the center of a hole

The center of a hole is found by probing a minimum of three points on the edge of the hole.

To set the datum from the center of a hole:

- Press DATUM>ZERO>HOLE.
- Probe a minimum of three points around the edge of the hole.
- Press the FINISH key.

Distributing the probed points evenly around the circumference of the hole will provide a more accurate placement for the center of the hole.



A minimum of three points is probed around the edge of a hole

Moving a datum

If the datum of the part is not reachable by a probe it can be moved by entering the coordinates from a point that has been probed.

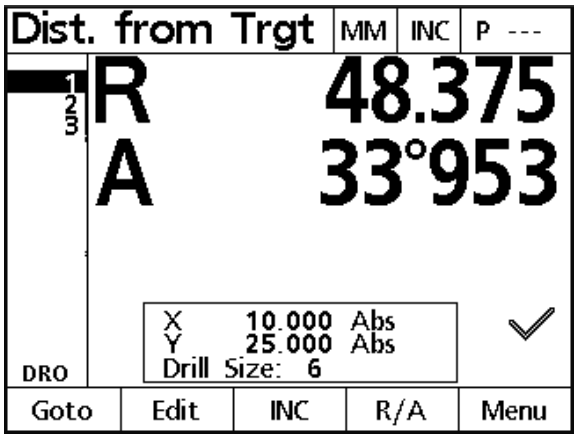
To move the datum:

- Press DATUM>MOVE 0.
- Enter the X distance in relationship to the probed datum point.
- Press the ENTER key.
- Enter the Y distance in relationship to the probed datum point.
- Press the FINISH key.

1.4 Targets

Entering a target

The ND 1200R allows simple entry of target position coordinates. As target position coordinates are entered a target list is created. The target list is shown on the left side of the LCD screen.

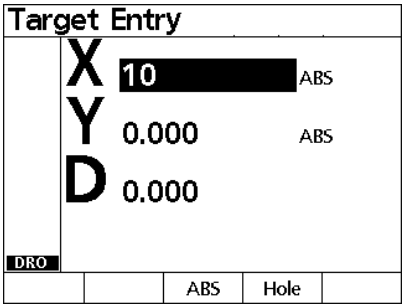


Target list shown on left side of screen

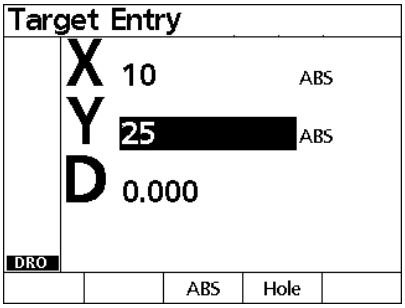
Entering an absolute target position

To enter an absolute target position:

- Press the X axis key.
- Enter the X coordinate for the target.
- Press the ENTER key.
- Enter the Y coordinate for the target.
- Press the FINISH key.



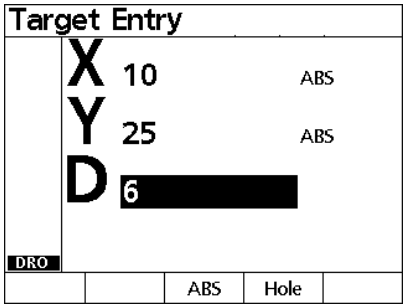
Enter the X coordinate for the target



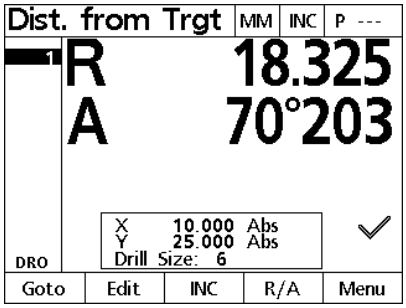
Enter the Y coordinate for the target

Optional: Prior to pressing the FINISH key a drill diameter may be entered. The diameter is for user reference only and does not effect target position calculation.

- Press the ENTER key.
- Enter the drill diameter.
- Press the FINISH key.



Optional: Enter the drill bit diameter

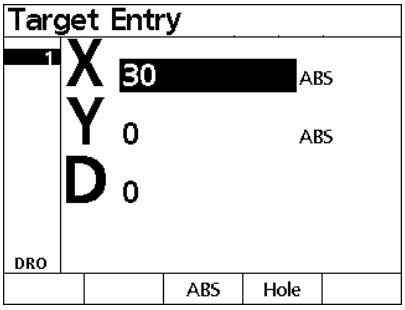


The new target is added to the target list and the Dist from Trgt screen is displayed

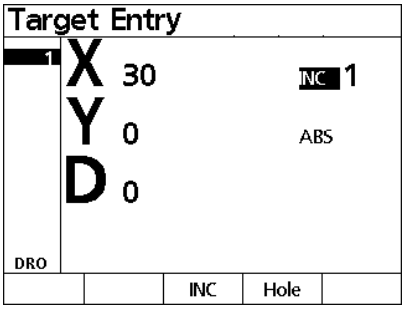
Entering an incremental target position

To enter an incremental target position:

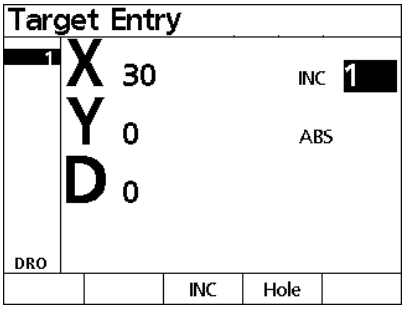
- Press the X axis key.
- Enter the X coordinate for a new target relative to a previously entered target.
- Press the ABS/INC soft key to toggle to incremental mode.
- Enter the number of the previously entered target.
- Press the ENTER key.



Enter the X coordinate for the new target relative to a previously entered target



Press the ABS/INC soft key to toggle to incremental mode

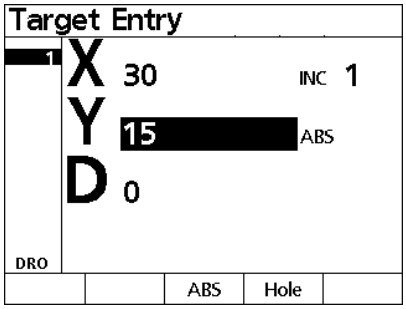


Enter the number of the previously entered target

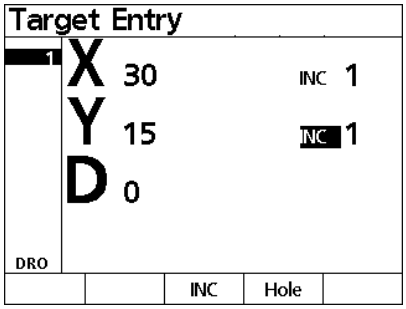
- Enter the Y coordinate for the new target relative to a previously entered target.
- Press the ABS/INC soft key to toggle to incremental mode.
- Enter the number of the previously entered target.
- Press the FINISH key.

Optional: Prior to pressing the FINISH key a drill diameter may be entered. The diameter is for user reference only and does not effect target position calculation.

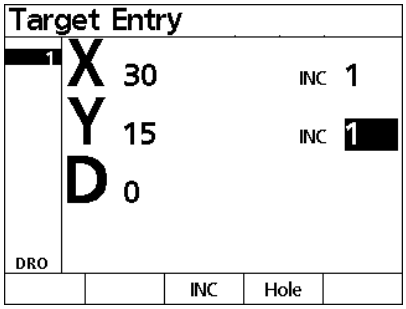
- Press the ENTER key.
- Enter the drill diameter.
- Press the FINISH key.



Enter the Y coordinate for the new target relative to a previously entered target



Press the ABS/INC soft key to toggle to incremental mode



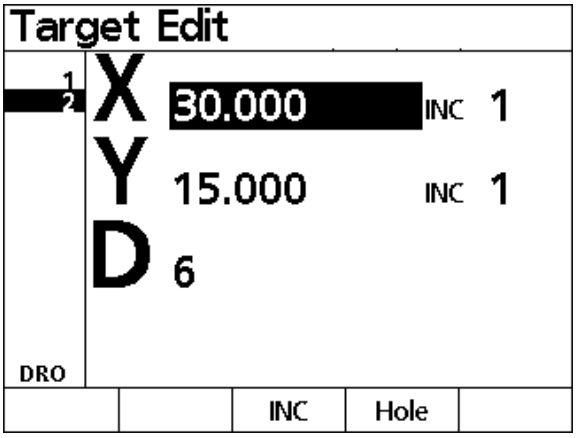
Enter the number of the previously entered target

Editing and clearing targets

Editing a target

To edit a target:

- Use the UP and DOWN ARROW keys to select a target in the target list.
- Press the EDIT soft key. The Target Edit screen is displayed.
- To edit target position coordinates, follow the previous instructions for entering a target position.



Target Edit screen

Deleting a target

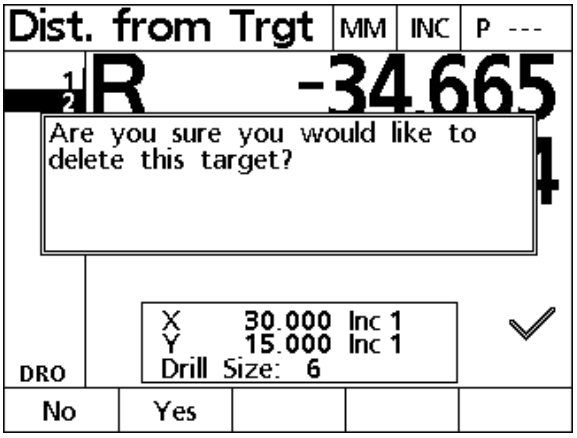
To delete a target:

- Use the UP and DOWN ARROW keys to select a target in the target list.
- Press the CANCEL key. A message on the LCD screen will ask "Are you sure you would like to delete this target?".
- Press the YES soft key.

Clearing the target list

To clear the target list:

- Press the LCD ON/OFF key. A message on the LCD screen will advise "The display will be turned of in 15 seconds or you may press one of the below soft keys to clear targets and datums."
- Press the CLEAR soft key.



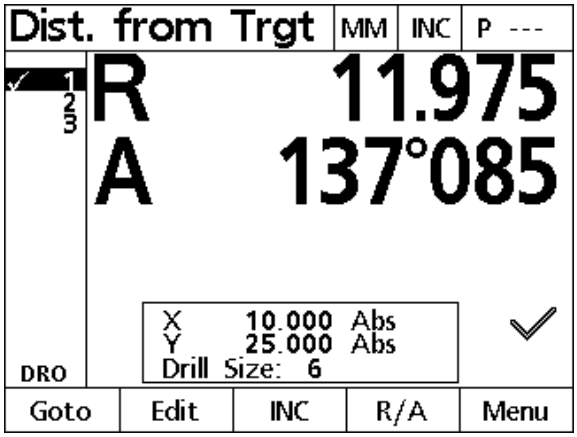
Deleting a target from the target list

Marking a target

Positions in the target list can be marked with a checkmark in order to identify the target for a future machining operation.

To mark a target:

- Use the UP and DOWN ARROW keys to select a target in the target list.
- Press the AXIS key next to the checkmark symbol to mark a target.



Target marked for future machining operation

1.5 Target patterns

Target patterns allow a way to quickly create targets by entering parameters for target coordinates arranged in one of four patterns.

Available patterns are:

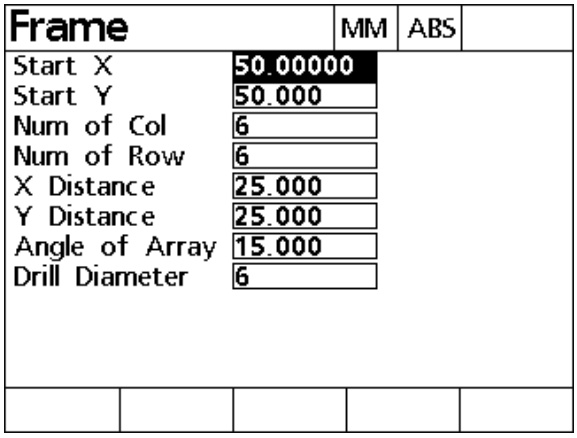
- Frame
- Rectangle
- Line
- Circle

Frame pattern

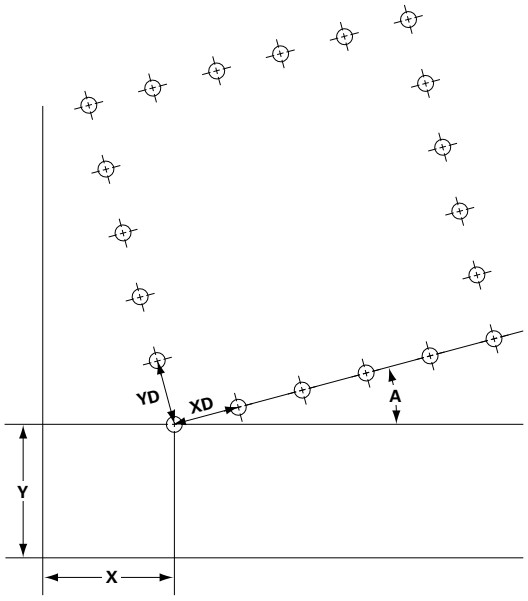
To create a Frame pattern:

- Press MENU>PATTERN>FRAME.
- Use the UP and DOWN ARROW keys to navigate between parameter data fields and enter the parameter values required for the pattern.
- Press the FINISH key. The targets in the pattern are added to the Target list and the Current Position screen is shown.
- Press the FINISH key again to navigate to the first target in the pattern.

Parameter	Description
Start X	X axis coordinate for the center of the first hole in the pattern.
Start Y	Y axis coordinate for the center of the first hole in the pattern.
Num of Col	Number of columns in the pattern.
Num of Row	Number of rows in the pattern.
X Distance	Distance between the center of each hole along the X axis prior to an angle being applied to the pattern.
Y Distance	Distance between the center of each hole along the Y axis prior to an angle being applied to the pattern.
Angle of Array	Angle applied to the pattern in relation to the X axis.
Drill Diameter	Diameter of the drill.



Frame pattern screen



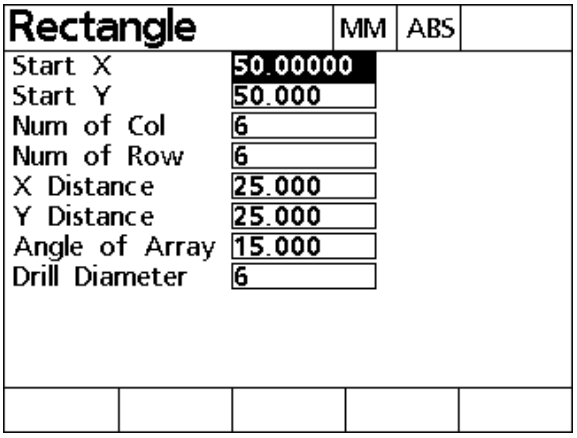
Frame pattern

Rectangle pattern

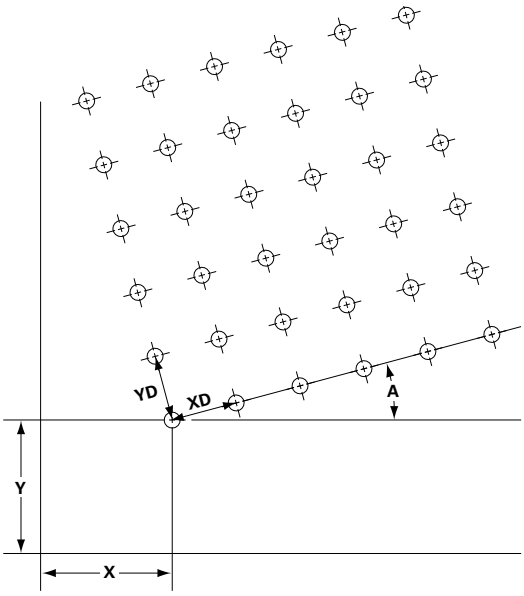
To create a Rectangle pattern:

- Press MENU>PATTERN>RECT.
- Use the UP and DOWN ARROW keys to navigate between parameter data fields and enter the parameter values required for the pattern.
- Press the FINISH key. The targets in the pattern are added to the Target list and the Current Position screen is shown.
- Press the FINISH key again to navigate to the first target in the pattern.

Parameter	Description
Start X	X axis coordinate for the center of the first hole in the pattern.
Start Y	Y axis coordinate for the center of the first hole in the pattern.
Num of Col	Number of columns in the pattern.
Num of Row	Number of rows in the pattern.
X Distance	Distance between the center of each hole along the X axis prior to an angle being applied to the pattern.
Y Distance	Distance between the center of each hole along the Y axis prior to an angle being applied to the pattern.
Angle of Array	Angle applied to the pattern in relation to the X axis.
Drill Diameter	Diameter of the drill.



Rectangular pattern screen



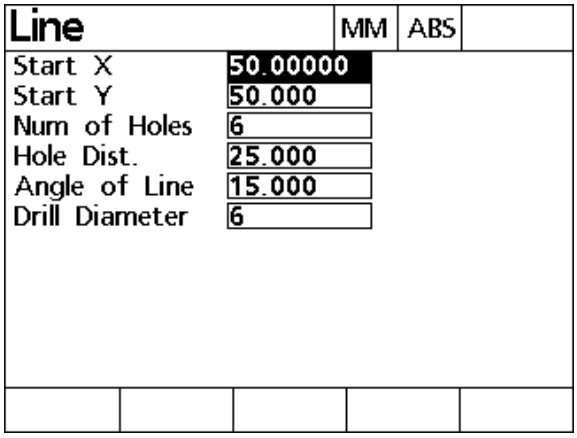
Rectangular pattern

Line pattern

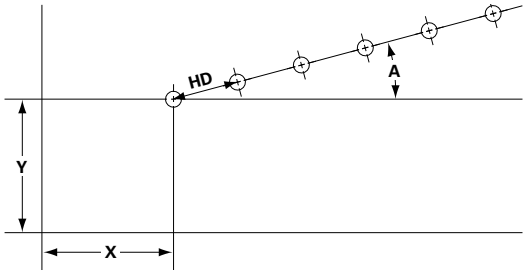
To create a Line drill pattern:

- Press MENU>PATTERN>LINE.
- Use the UP and DOWN ARROW keys to navigate between parameter data fields and enter the parameter values required for the pattern.
- Press the FINISH key. The targets in the pattern are added to the Target list and the Current Position screen is shown.
- Press the FINISH key again to navigate to the first target in the pattern.

Parameter	Description
Start X	X axis coordinate for the center of the first hole in the pattern.
Start Y	Y axis coordinate for the center of the first hole in the pattern.
Num of Holes	Number of holes in the pattern.
Hole Dist.	Distance between the center of each hole along the X axis prior to an angle being applied to the pattern.
Angle of Line	Angle applied to the pattern in relation to the X axis.
Drill Diameter	Diameter of the drill.



Line pattern screen



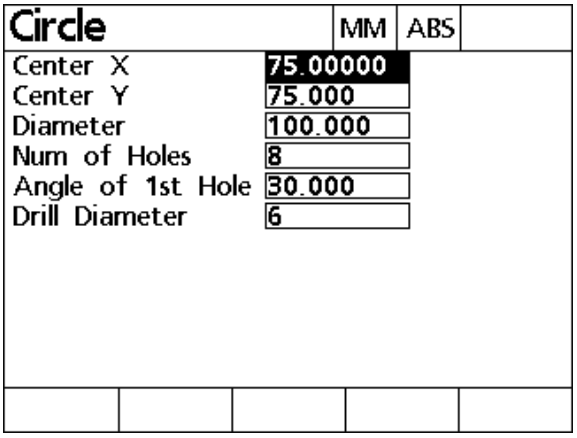
Line pattern

Circle pattern

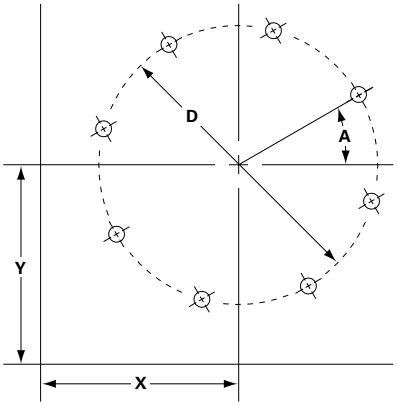
To create a Circle pattern:

- Press MENU>PATTERN>CIRCLE.
- Use the UP and DOWN ARROW keys to navigate between parameter data fields and enter the parameter values required for the pattern.
- Press the FINISH key. The targets in the pattern are added to the Target list and the Current Position screen is shown.
- Press the FINISH key again to navigate to the first target in the pattern.

Parameter	Description
Center X	X axis coordinate for the center of the pattern.
Center Y	Y axis coordinate for the center of the pattern.
Diameter	Diameter of the circle for the pattern.
Num of Holes	Number of holes in the pattern.
Angle of 1st Hole	Angle applied to the first hole in the pattern in relation to the X axis.
Drill Diameter	Diameter of the drill bit.



Circle pattern screen



Circle pattern

1.6 Target programs

Target programs permit the user to save and run target list sequences for later use. This allows the user to switch between workpieces and programs without having to re-enter target coordinates.

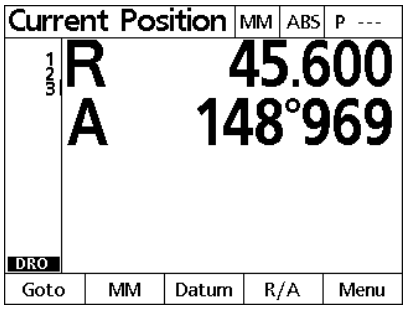
Target programs can be:

- Saved
- Run
- Mirrored
- Printed
- Deleted

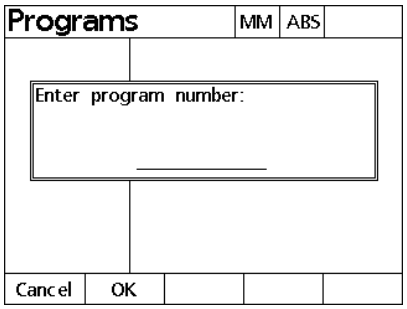
Saving a program

To save a target program:

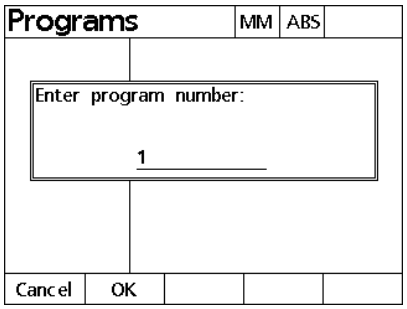
- Create a target sequence.
- Press MENU>PROG>SAVE.
- Enter a number for the program. A maximum of 12 digits may be used for the number.
- Press the OK soft key.



Create a target list



Press MENU>PROG>SAVE

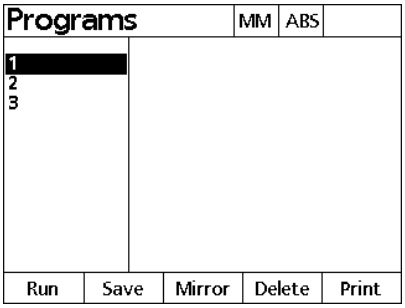


Enter a program number and press the OK soft key

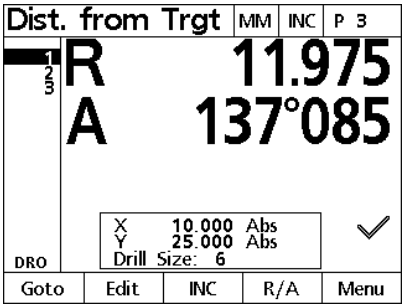
Running a program

To run a target program:

- Press MENU>PROG.
- Use the UP and DOWN ARROW keys to select a program.
- Press the RUN soft key. The Distance to Target screen is displayed and the program number is displayed in the upper right corner of the screen.



Press MENU>PROG, select a program and press the RUN soft key

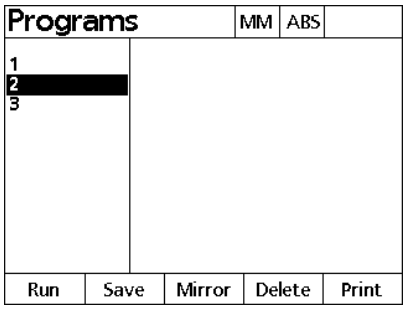


The Distance from Target screen is displayed

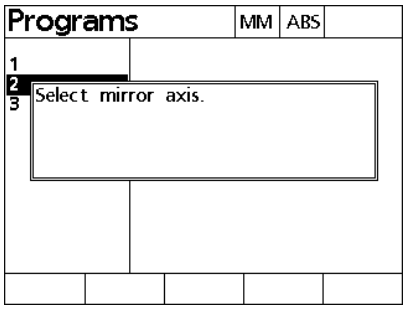
Mirroring a program

To mirror a target program:

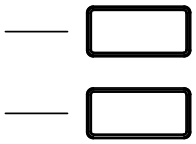
- Press MENU>PROG.
- Use the UP and DOWN ARROW keys to select a program.
- Press the MIRROR soft key.
- Press the AXIS key for the axis to mirror the program along. The DIstance from Target screen is displayed.



Press MENU>PROG and select a program



Press the MIRROR soft key

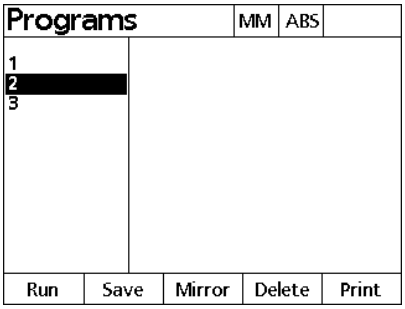


Press an axis key to select an axis to mirror along

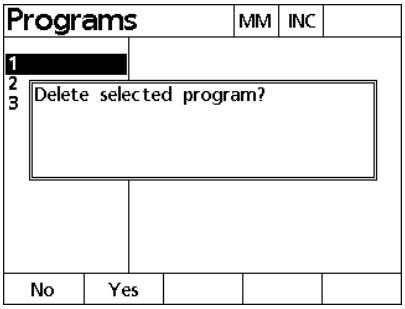
Deleting a program

To delete a target program:

- Press MENU>PROG>.
- Use the UP and DOWN ARROW keys to select a program.
- Press the DELETE soft key.
- Press the YES soft key to confirm program deletion.



Press MENU>PROG and select a program



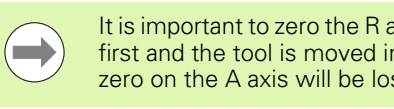
Press the DELETE soft key and the YES soft key to confirm program deletion

1.7 Navigating to a target

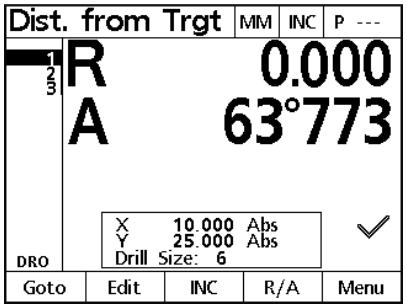
The ND 1200R displays all entered target positions as an R (radius) and A (angle) distance from the current position. Navigating to a target is accomplished by moving the drill head to zero directly above the desired target position. This is for either direct targeting or from the Pattern function.

To navigate to a target:

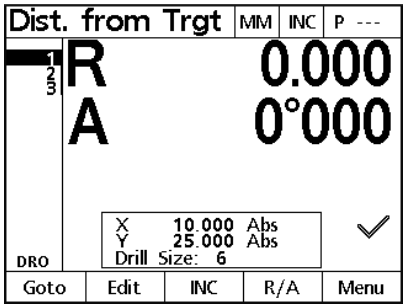
- Select a target. The Distance from Target screen is displayed.
- Move the tool in or out along the R axis until the R display reads zero.
- Rotate the radial arm until the A display reads zero. The tool is now positioned above the center of the target.
- Lock the drill head and drill the hole.



It is important to zero the R axis first. If the A axis is zeroed first and the tool is moved in or out along the R axis, the zero on the A axis will be lost.



Move the tool in or out until the R axis reads zero



Move the radial arm until the A axis reads zero

1.7 Navigating to a target

2

Installation, Setup and Specifications

2.1 ND 1200R Shipment Contents

The contents of your ND 1200R shipment are described below. Repackaging instructions are also included for return shipments for distributors and OEM customers that are configuring a ND 1200R and shipping it to an end-user.

Save the ND 1200R packaging materials for possible return shipment or shipment to an end-user.

Items included with the ND 1200R

The following items are shipped with the ND 1200R:

- ND 1200R instrument
- Mounting stand hardware
- Power cord
- ND 1200R Quick reference guide
- Warranty registration card

Optional items possibly included

The following items might be shipped with your ND 1200R, depending on the options and accessories ordered at the time of purchase:

- Remote foot switch
- Remote keypad
- ND 1200R Protective cover
- QC-Wedge communication software

If any components were damaged in shipment, save the packaging materials for inspection and contact your shipping agent for mediation. Contact your Heidenhain distributor or OEM for replacement parts.

Repackaging the ND 1200R

When shipping the ND 1200R on to an end-user, repackage all ND 1200R components in the original packaging as received from the factory.

The original packaging must be duplicated and the LCD must be inserted face-up to prevent damage to the screen.

It is not necessary to ship the mounting stand and hardware with the instrument when returning the ND 1200R for service.

- Connect the mounting screws and washer to the ND 1200R instrument.
- Replace the contents of the cardboard box insert if shipping the ND 1200R on to an end-user. The cardboard box can be empty if returning the ND 1200R to the factory for service.
- Repackage the instrument, foam and cardboard box insert as originally shipped from the factory. The instrument should be oriented face-up in the carton.
- Replace the warranty card and slip sheets originally found at the top of the carton when shipping on to an end-user. The "Before you begin" slip sheet should be inserted last.

2.2 Hardware Installation

The ND 1200R is easy to install. This section describes how to install the ND 1200R hardware.

Assembling the mounting stand

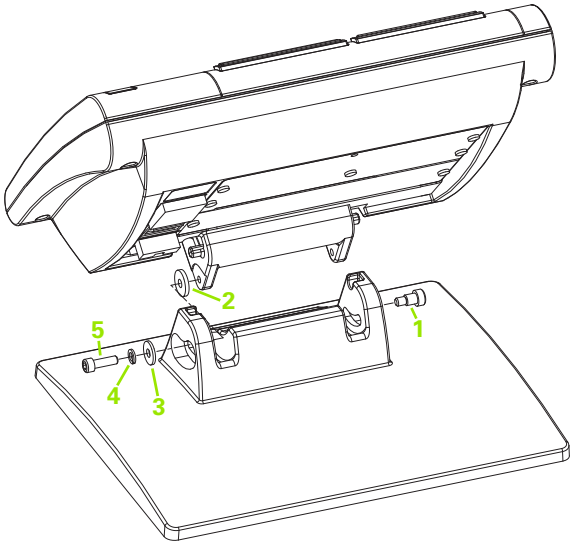
The ND 1200R is secured to the swivel slots of the mounting stand by a shoulder screw, a cap screw and associated washers.

- Assemble the ND 1200R to the mounting stand as shown on the right
- Tighten the shoulder screw (**1**).
- Tighten the cap screw (**5**) and washers (**3** & **4**) enough so that the ND 1200R will be secure when adjusted to the desired tilt position.
- Adjust the ND 1200R to the desired tilt position.
- Complete tightening the cap screw (**5**) to secure the ND 1200R.

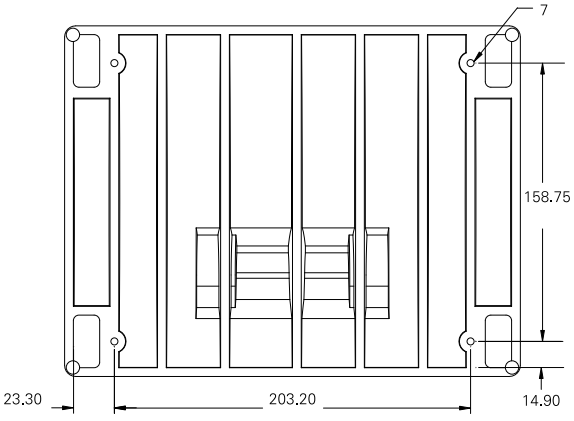
Benchtop location and mounting

Rest the ND 1200R on a flat, stable surface, or bolt it to a stable surface from the bottom using four 10/32 screws fastened in the pattern shown at the right.

The dimensions are shown in millimeters.



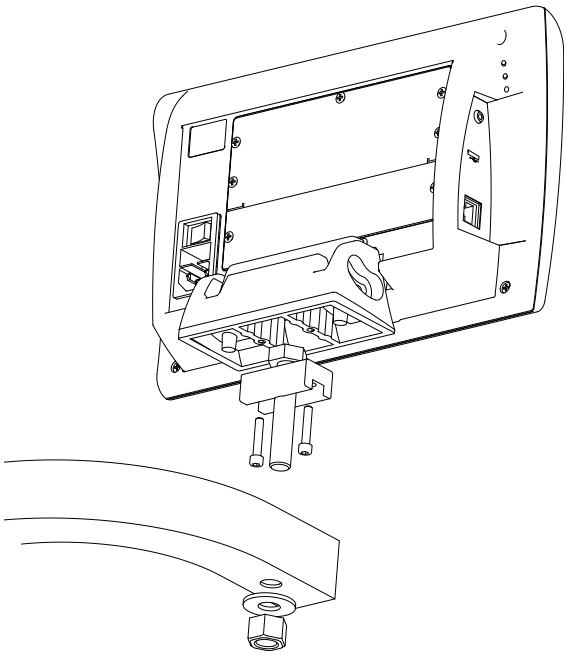
Mounting stand assembly



Mounting hole pattern

Arm mounting (optional)

Secure the arm mount adapter to the ND 1200R and bolt the adapter and ND 1200R to the arm as shown at the right.



Optional arm mounting

Connecting power

Connect the ND 1200R to power through a high-quality power surge suppressor. Surge suppressors limit the amplitude of potentially damaging power line transients caused by electrical machinery or lightning, and protect the ND 1200R from most power line transients that can corrupt system memory or damage circuits.

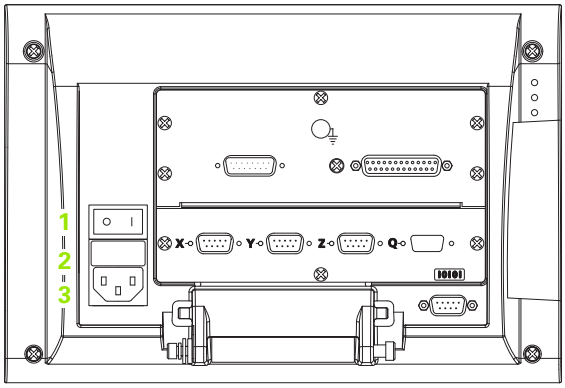
Do not locate the power cord where it can be walked on or will create a tripping hazard. Connect the 3-wire power plug to only a 3-wire grounded power outlet.

Never connect 2-wire to 3-wire adapters to the power cord or remove the third ground wire to fit the plug into a 2-wire electrical outlet. Modifying or overriding the third-wire ground creates a safety hazard and should not be permitted.

The power connector assembly includes:

1 Power switch
2 Fuse compartment
3 Power cord connector

Always disconnect the power cord from the source of AC power before unplugging it from the ND 1200R power connector. The AC voltage available at electrical outlets is extremely dangerous and can cause serious injury or death.

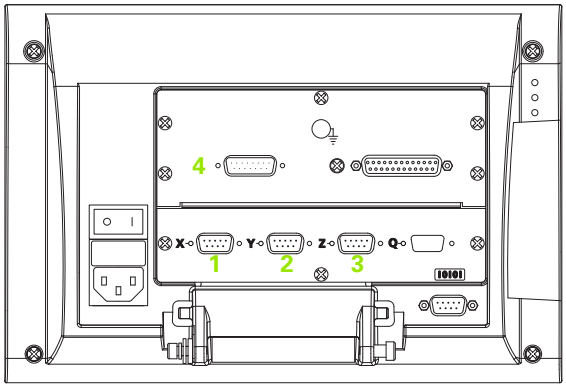


Power switch, fuse and connector

Connecting encoders and probes

Axis encoders and probes are attached to interface connectors on the rear of the ND 1200R. Many encoder interfaces are available to match the wide variety of encoders that can be used with the ND 1200R. The type and number of axis encoder connectors will vary depending on the application. The ND 1200R shown in this photo includes connectors for the X, Y and Z axes and a touch probe. Encoder inputs are specified as analog or TTL at the time of purchase and cannot be changed in the field.

Do not locate encoder cables where they can be walked on or will create a tripping hazard.



Encoder axis connectors

The encoder connector locations are:

1 X-axis
2 Y-axis
3 Z-axis
4 Touch probe

To connect the encoder cables and probe:

- Verify that the ND 1200R is off.
- Connect the axis encoders tightly to their connectors. An axis label is provided near each connector. If the connectors include mounting screws, do not overtighten them.

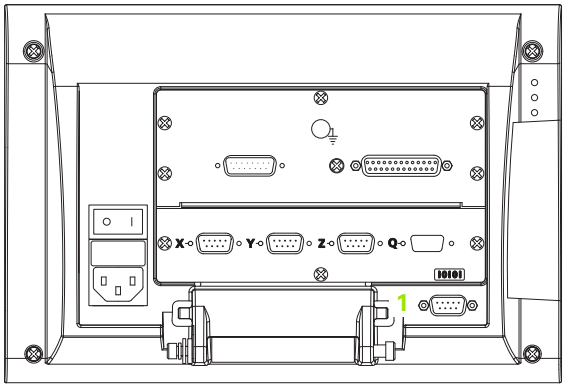
Connecting a computer

Measurement result data can be sent to a computer over the RS-232 port (1) using a serial cable that does not include crossed wires. To connect a computer:

- Verify that the ND 1200R and the computer power are off.
- Connect a computer COM port to the ND 1200R RS-232 serial port (1) using a standard straight-through serial cable. Make sure the cable connectors are tight, but do not overtighten the connector screws.
- Apply power to the computer, and then the ND 1200R. The ND 1200R default settings for communication over the RS-232 serial port (1) are:

Baud rate	115,200
Word length	8 bits
Stop bits	1 bit
Parity	None

- Launch the computer application that will be used to communicate with the ND 1200R, and configure the communication properties of the COM port to match those of the ND 1200R.



RS-232 connector

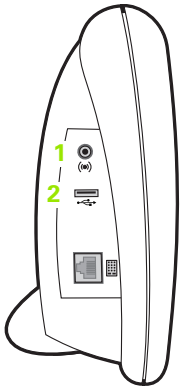
Connecting a headphone

Audio alerts can be sent to headphones in areas that are noisy and make it difficult to hear, or are quiet where audio alerts might create a disturbance.

The speaker jack (1) is located on the side of the ND 1200R.

To connect headphones:

- Verify that the ND 1200R power is off. Plug the headphones into the speaker jack (1) on the side of the enclosure.
- Make sure the headphone plug is fully inserted.



Headphone, USB connectors

Connecting a USB printer

The ND 1200R supports certain USB printers. Printer models are specified by Heidenhain at the time of purchase, or approved by Heidenhain later.

The USB port (2) is located on the side of the ND 1200R.

To connect a USB printer:

- Verify that the ND 1200R and printer power are off. Connect the USB printer to the USB Type A port (2) on the side of the enclosure.
- Make sure the USB cable plug is fully inserted.

Connecting an optional foot switch or remote keypad

The optional foot switch and remote keypad are connected to the RJ-45 connector on the side of the ND 1200R.

Often, only the optional foot switch or remote keypad is used. However, two options can be connected simultaneously using a RJ-45 splitter.

The RJ-45 connector and splitter are shown here:

1 RJ-45 connector
2 RJ-45 splitter

RJ-45 splitters are available from most retail electronics stores.

The foot switch and remote keypad can be used individually or in combination:

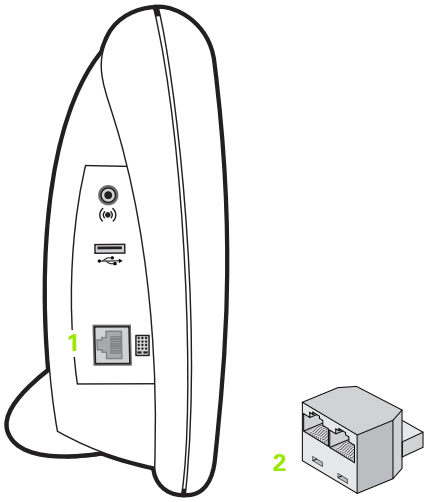
- foot switch
- remote keypad
- foot switch and remote keypad

When the foot switch and remote keypad are connected using the RJ-45 splitter, all operating functions of each device are retained. However, the switch shares Hot Key mapping with the number keys 7 and 8 of the remote keypad. As a result, functions assigned to the two switch contacts will also be mapped to remote keypad numbers 7 and 8.

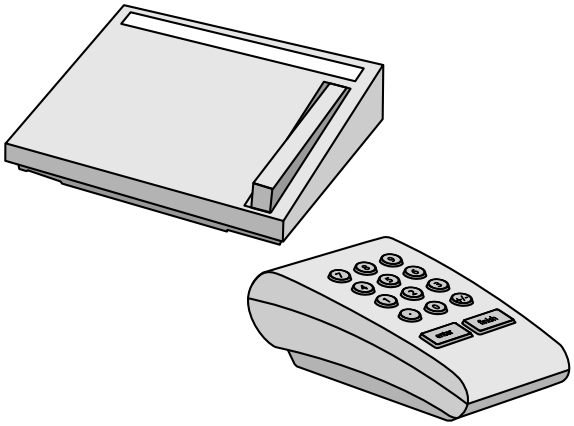
Hot keys are discussed later in this chapter under Software setup/Hotkeys. See "Hot key assignments" on page 78.

To connect the foot switch or remote keypad:

- Verify that the ND 1200R is off.
- Plug an RJ-45 splitter into the ND 1200R RJ-45 connector if multiple devices will be used.
- Connect the RJ-45 plug of the devices into the RJ-45 splitter if multiple devices will be used, or directly into the ND 1200R RJ-45 connector if only a single device will be used.



RJ-45 connector and RJ-45 splitter



Optional foot switch and remote keypad

2.3 Software setup

The operating parameters of the ND 1200R must be configured prior to using it for the first time, and any time drilling or communication requirements change. Day to day use of the ND 1200R does not require reconfiguration of software settings.

Parameter changes made in any of the setup screens can change the operation of the ND 1200R. For this reason, setup parameters are password-protected. Only qualified personnel should be given password access to setup screens. The unlocking of password-protected setup functions is described on page 65.

Software is configured manually using the setup menu screens.

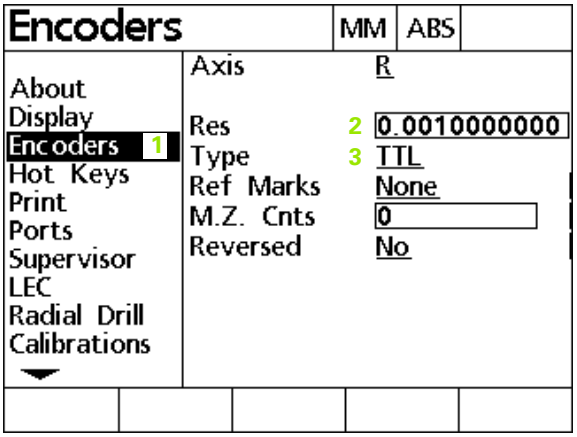
Parameters configured in setup screens will be retained until:

- The data-backup battery is changed
- The data and settings are cleared by maintenance personnel
- Parameters are changed using the setup menu screens
- Certain software upgrades are performed

Setup menu

Most operating parameters of the ND 1200R are configured using screens and data fields accessed from the setup menu. Highlighting setup menu items on the left side of the setup screen displays the corresponding setup parameter data fields and choice fields on the right side of the screen.

1 Setup menu item: Setup screen name
2 Setup data field: Setup data are entered
3 Setup choice field: Setup choices are made



Setup screen menu items, data fields and choice fields

The setup menu is easy to use:

- Press the MENU soft key and then press the SETUP soft key.
- Navigate up or down in the menu to highlight the desired menu item using the UP/DOWN ARROW keys.
- Navigate from the menu (left side) to the setup fields (right side) using the LEFT/RIGHT ARROW keys.
- Navigate up or down to highlight the desired data or choice field using the UP/DOWN ARROW keys.
- Enter setup data using the NUMERIC KEYPAD, or choose a setup parameter choice from soft key selections or list shown when the field is highlighted.
- Press the FINISH key to save the entry and return to the setup menu.
- Press the FINISH key again to return to the DRO.

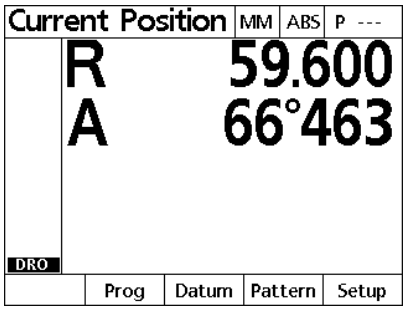
An example of using the setup menu to enter the supervisor password is shown on the next page.

Setup example: entering the supervisor password

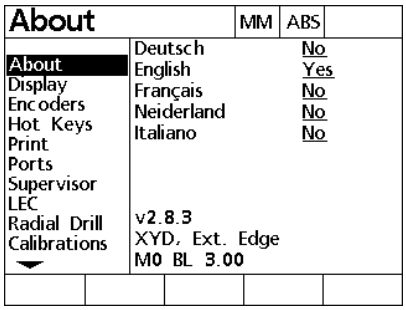
Critical setup parameters are password-protected. Only qualified personnel should be given password access to setup screen parameters. In this example, the setup menu is navigated to the Supervisor screen and the supervisor password is entered.

To enter the supervisor password:

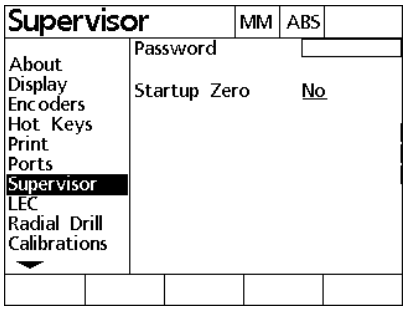
- Press the MENU soft key to display the menu soft keys.
- Press the SETUP soft key to display the setup menu.
- Navigate up or down in the menu to highlight the Supervisor menu item using the UP/DOWN ARROW keys.



The MENU soft key is pressed to display the menu soft keys

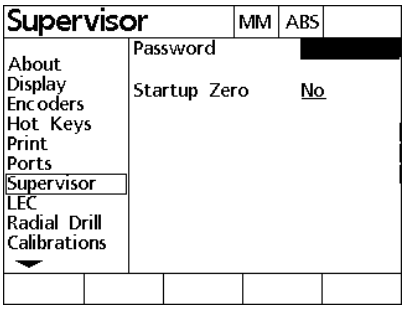


The SETUP soft key is pressed to display the setup menu

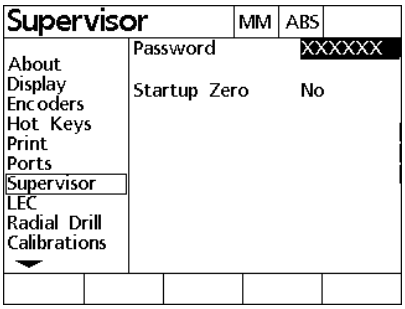


The UP/DOWN ARROW keys are used to highlight the Supervisor menu item

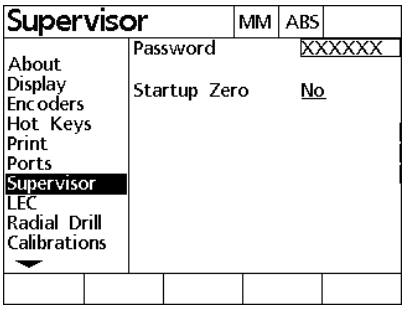
- Navigate from the menu to the Password setup field using the RIGHT ARROW key.
- Enter the supervisor password using the NUMERIC KEYPAD.



The RIGHT ARROW key is used to highlight the Password data field



The supervisor password is entered using the NUMERIC KEYPAD



The FINISH key is pressed to save the password and return to the setup menu

- Press the FINISH key to save the password and return to the setup menu.
- Press the FINISH key to return to the DRO.

Order of setup

The ND 1200R setup software is contained on up to 12 screens, depending on the hardware configuration. It is possible that not all the setup screens described in this chapter are active in your system. Disregard screen descriptions that do not apply to your ND 1200R.

The initial ND 1200R setup tasks should be performed in the order listed here. Instructions are presented in this order on subsequent pages.

Initial setup tasks	Setup screens
1: Language selection and product version information	About
2: Supervisor password entry and program unlocking	Supervisor
3: Encoder configuration	Encoders and Misc
4. Touch probe configuration	Radial
5: Error correction	LEC
6: Display formatting	Display

The additional setup tasks can be performed in any order.

Remaining setup tasks	Setup screens
Hot key assignments	Hot keys
Print formatting	Print and Form characters screens
RS-232 and USB port configuration	Ports
Audio volume	Misc
Key repeat delay	Misc
Screen saver activation	Misc.
Time and date	Clock

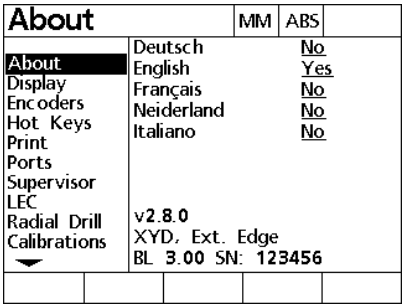
Language selection and product version

The About screen contains selections for changing the language of text displayed on the screen and included in transmitted or printed data. Product software and hardware information is also provided on the About screen.

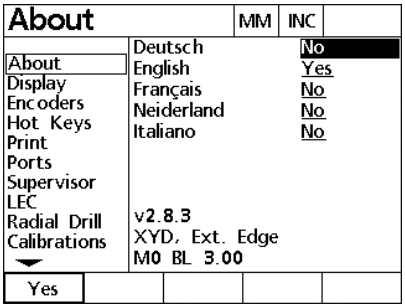
The product software and hardware version information will be required if technical support is needed.

To select a language:

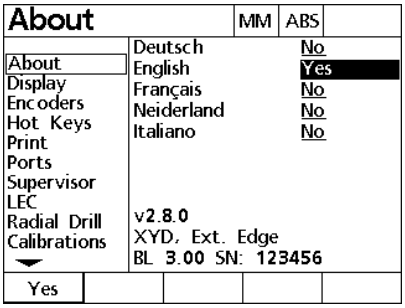
- Press MENU>SETUP to display the setup menu and highlight the About menu item.
- Press the RIGHT ARROW key to highlight the first language selection field.
- Use the UP/DOWN ARROW keys to select the desired language.
- Press the YES soft key.



Highlight the About menu item



Highlight the first language selection field



Highlight a language and press the YES soft key

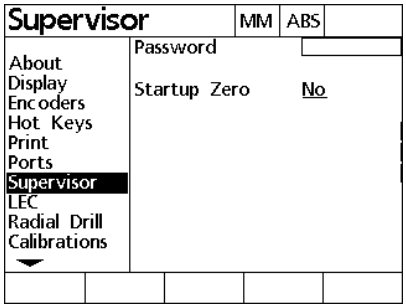
- Press the FINISH key to save the language and return to the setup menu.

Supervisor password

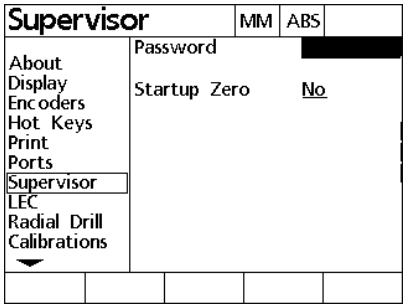
The Supervisor screen contains the Password data field and Startup Zero choice field.

Most setup parameters are password-protected and setup can only be performed after the password is entered. To enter the supervisor password:

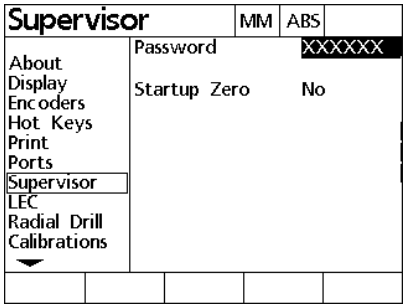
- Press MENU>SETUP to display the setup menu and then highlight the Supervisor menu item.
- Highlight the Password data field.
- Enter the supervisor password.



Highlight the Supervisor menu item



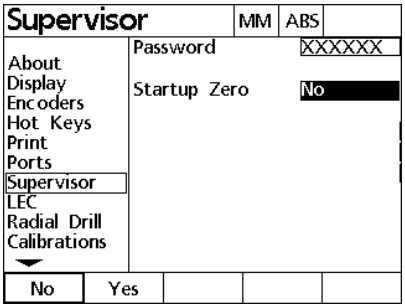
Highlight the Password data field



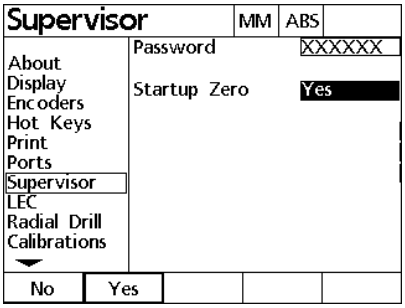
Enter the password

To enable Startup Zero:

- Highlight the Startup Zero choice field.
- Press the YES soft key.



Highlight the Startup Zero choice field



Press the YES soft key

- Press the FINISH key to save parameters and return to the setup menu.

Encoder configuration

The Encoders and Misc screens contain data and choice fields for configuring the encoders.

Encoders screen

The Encoders screen configuration fields include:

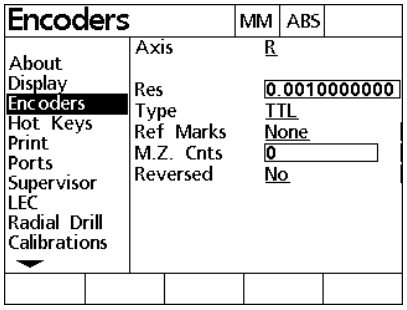
- Axis selection
- Encoder resolution
- Encoder type (TTL, analog or serial)
- Reference mark selection
- Machine zero offset (MZ Cnts)
- Reversing encoder count direction

To configure encoder settings in the Encoders screen:

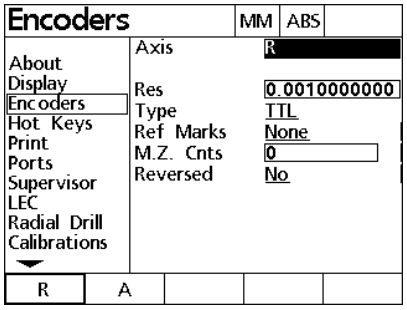
- Press MENU>SETUP to display the setup menu and then highlight the Encoders menu item.
- Highlight the Axis choice field and then press a soft key to select the desired axis.

The setup process for all axes is identical.

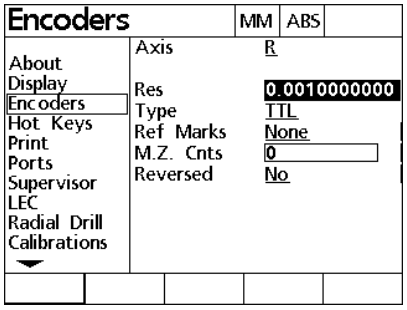
- Highlight the Res data field and then enter the encoder resolution in the units shown in the Units choice field.



Encoders menu item is highlighted



Press an axis soft key



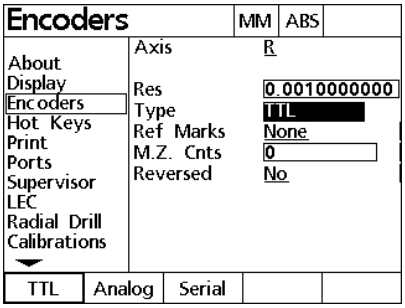
Enter the encoder resolution

- Highlight the Type choice field and then press a soft key to select the encoder type.
- Highlight the Ref Marks choice field and then press a soft key to select the encoder reference mark type.

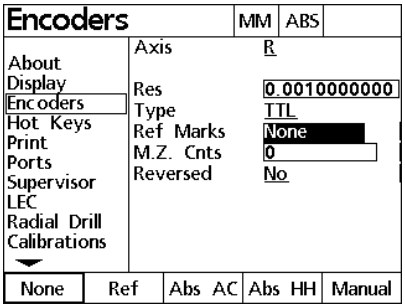
The M.Z. Cnts (Machine zero counts) data field is rarely used to specify an offset from the machine zero position created by crossing encoder reference marks.

Custom machine zeroes are rarely used because datums are always established before performing measurements.

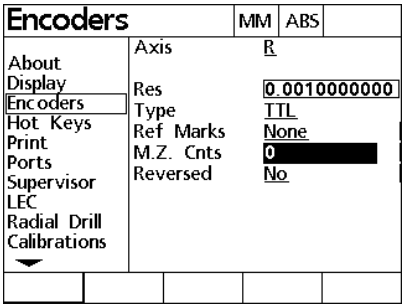
- To specify a custom machine zero, highlight the M.Z. Cnts data field and enter the machine zero offset in machine counts as determined by: Machine counts = DRO value/encoder resolution.



Select the encoder type

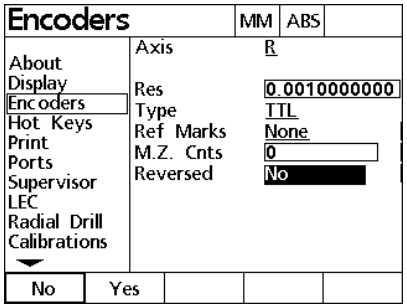


Select an encoder reference mark type



Enter machine zero offset counts if required

- Highlight the Reversed choice field and then press the YES soft key to reverse the encoder count direction.



Choose a count direction

- Press the FINISH key to save parameters and return to the setup menu.

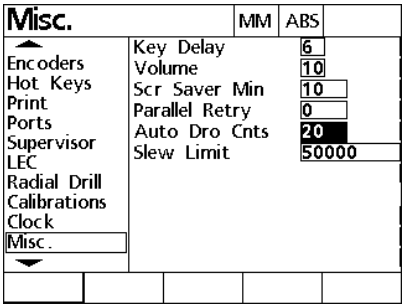
Misc screen

The Misc screen encoder configuration fields include:

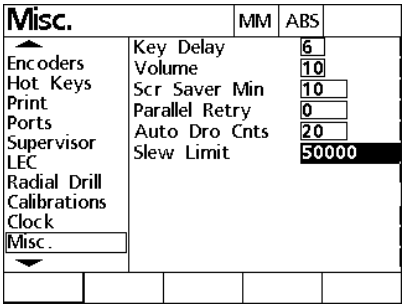
- Auto DRO counts: The number of least significant DRO counts required to refresh the DRO with new axis values.
- Slew limit for the axes: High input slew rates resulting from rapid input encoder motion can result in erroneous measurements. Erroneous measurements are avoided by displaying encoder error warnings when encoder values change at very high rates.

To configure encoder settings in the Misc screen:

- Press MENU>SETUP to display the setup menu and then highlight the Misc menu item.
- Highlight the Auto DRO Cnts data field and enter the number of DRO counts (axis motion) in the least significant digit position required to automatically refresh the DRO axis values.
- Highlight the Slew Limit data field and enter the slew rate limit (increments of resolution per second). For example, at a channel resolution of 0.001 mm, a slew rate limit of 50,000 will result in warning messages at encoder motion rates higher than 50 mm per second.



Enter Auto DRO counts



Enter the slew rate limit in encoder counts per second

- Press the FINISH key to save parameters and return to the setup menu.

Probe configuration

The Radial screen contains data and choice fields for configuring a probe.

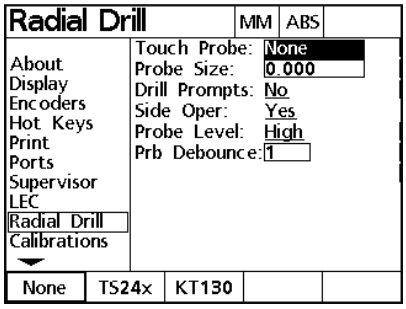
Radial screen

The Radial screen configuration fields include:

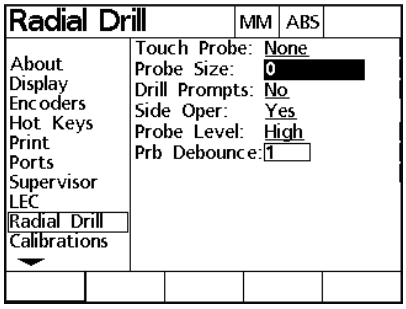
- Touch probe type
- Probe size
- Prompts for drilling
- Side operation
- Probe level
- Probe debounce

To configure probe settings in the Radial screen:

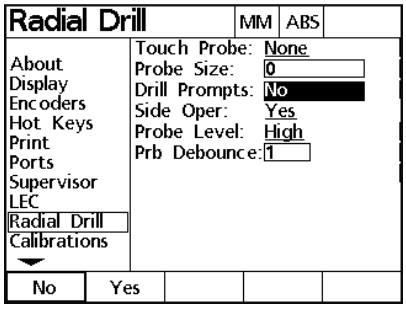
- Press MENU>SETUP to display the setup menu and then highlight the Radial menu item.
- Highlight the Touch Probe choice field and then press a soft key to select the probe type.
- Highlight the Probe Size data field and then enter the diameter of the probe.
- Highlight the Drill Prompts choice field and then press a soft key to select prompting for drill changes.



Select a touch probe type

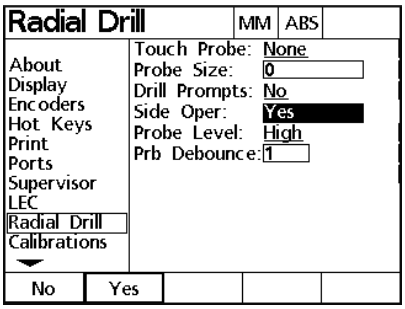


Enter a probe size

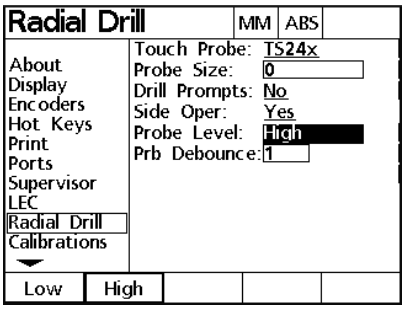


Select display of drill prompts

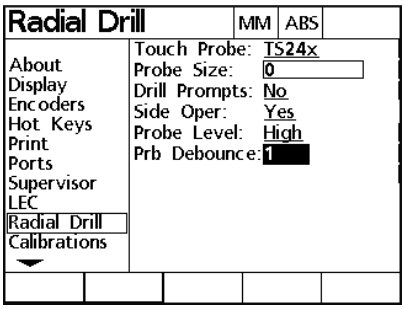
- Highlight the Side Oper choice field and then press a soft key to select side operation.
- Highlight the Probe Level choice field and then press a soft key to select High or Low probe level.
- Highlight the Prb Debounce data field and then enter the minimum time the probe must be stable in seconds.



Select side operation



Select probe level



Enter the probe debounce time in seconds

- Press the FINISH key to save parameters and return to the setup menu.

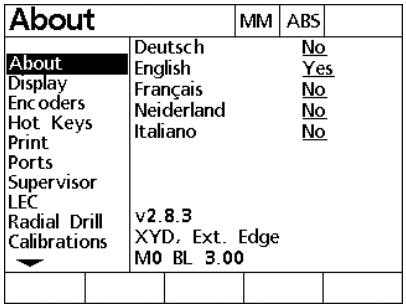
Error correction

The ND 1200R provides Linear Error Correction for the R axis. LEC compensates for encoder and machine travel variations with error correction coefficients. Coefficients are determined by comparing actual measurements of a standard to the nominal values imprinted on it.

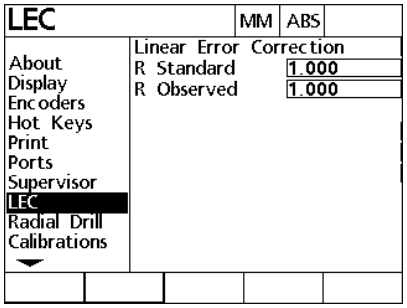
Linear error correction (LEC)

Linear Error Correction is performed in the LEC setup screen and compensates for variations along the R axis using one correction coefficient for the entire range of motion on the axis. For example, an LEC coefficient of 0.0002 per inch applied to a 6 inch measurement along an axis produces a result of 6.0012 inches. To apply LEC to the R axis:

- Press MENU>SETUP to display the setup menu.
- Highlight the LEC menu item and make sure that all correction values are 1.0.



Press MENU>SETUP to display the Setup menu



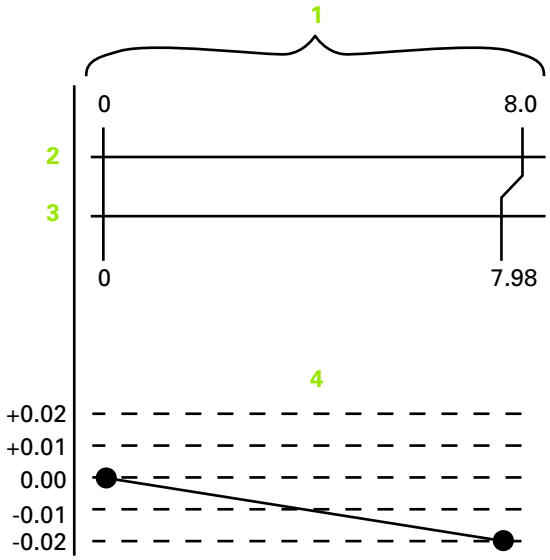
Highlight the LEC menu item and make sure that all correction values are 1.0

- Position the standard artifact along the R axis.
- Align the artifact as closely as possible to the axis and then perform a skew alignment as described in chapter 1 (see "Aligning the part to an axis" on page 28).
- Perform a single measurement of the entire range of motion using the standard artifact and make a note of the result.

Use an artifact that allows measurements of as much of the axis range of motion as possible.

In this example of applying LEC, one point at end of the axis measurement range is measured using an 8 inch standard.

Arrow number	Descriptions
1: Standard length	Entire 8 inch length is measured
2: Standard values	The certified length of the standard
3: Observed values	The measured length of the standard
4: Deviation graph	Difference between standard and observed values (not entered into any screen)

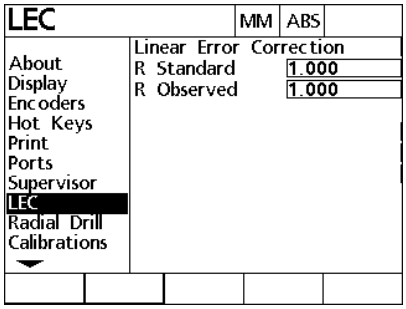


LEC example using an 8 inch standard

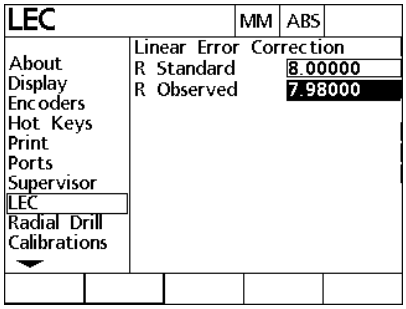
To perform the linear error correction in the LEC screen:

- Highlight the LEC menu item.
- Enter the Standard value of the artifact and the Observed value measured by the ND 1200R for the R axis.

The standard and observed values for axes should be 1.000 when no LEC correction is applied.



Highlight the LEC screen



Enter the standard and observed values for the R axis

- Press the FINISH key to save parameters and return to the setup menu.

Display formatting

The Display screen contains data and choice fields for configuring display resolution and other display parameters.

Display screen

The Display screen configuration fields include:

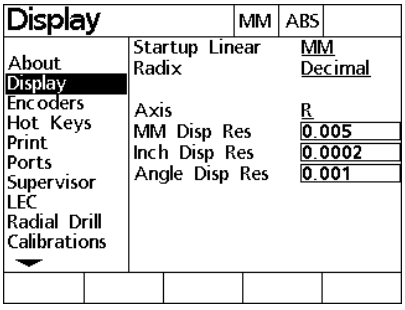
- Startup linear units of measure
- Selection of a comma or decimal point radix
- Resolutions for linear and angular measurements

To configure display settings:

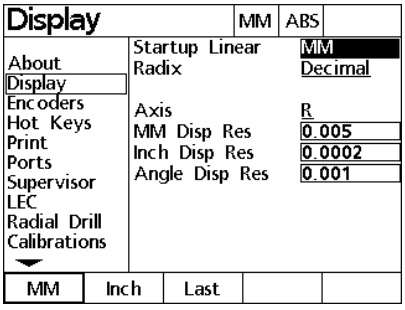
- Press MENU>SETUP to display the setup menu and then highlight the Display menu item.
- Highlight the Startup Linear choice field and press a soft key to specify a unit of linear measure set by the ND 1200R upon startup. Soft key selections are:

Soft key	Result
MM	The linear unit of measure will be millimeters
Inch	The linear unit of measure will be inches
Last	The linear unit of measure will not be changed

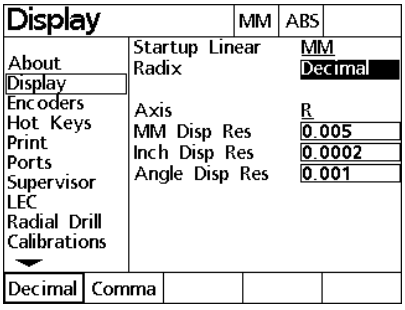
- Highlight the Radix choice field and press a soft key to select a Decimal or Comma radix.



Highlight the Display menu item

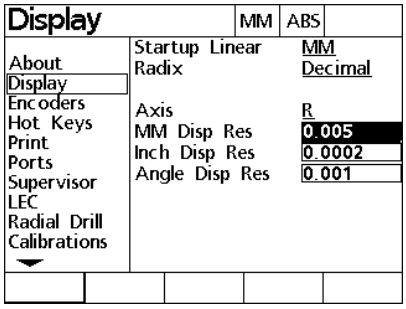


Specify a unit of linear measure set upon startup

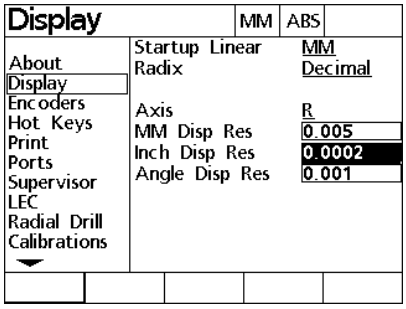


Select a Decimal or Comma radix

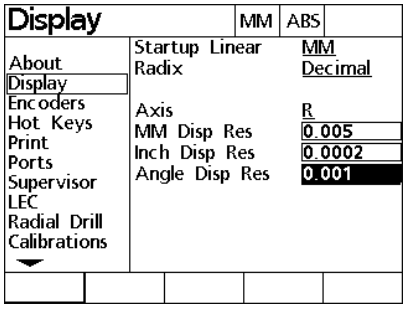
- Highlight the MM Disp Res data field and enter the display resolution index number. For example, an index number of 0.001 will round the display to 3 digits to the right of the radix character.
- Highlight the Inch Disp Res data field and enter the display resolution index number. For example, an index number of 0.001 will round the display to 3 digits to the right of the radix character.
- Highlight the Angle Disp Res data field and enter the display resolution index number. For example, an index number of 0.001 will round the display to 3 digits to the right of the radix character.



Enter the MM Display Resolution



Enter the Inch Display Resolution



Enter the Angle Display Resolution

- Highlight the axis selection field.
- Select the A axis and repeat the display resolution entry steps.
- Press the FINISH key to save parameters and return to the setup menu.

Hot key assignments

The Hot Keys setup screen is used to map frequently used functions to front panel keys, remote keypad keys and foot switch keys. Hot keys can save time by eliminating the need to navigate through menus to initiate a function, or by making a function more accessible through a foot switch or remote keypad.

ND 1200R keys and switches that are available for hot key mapping are shown here:

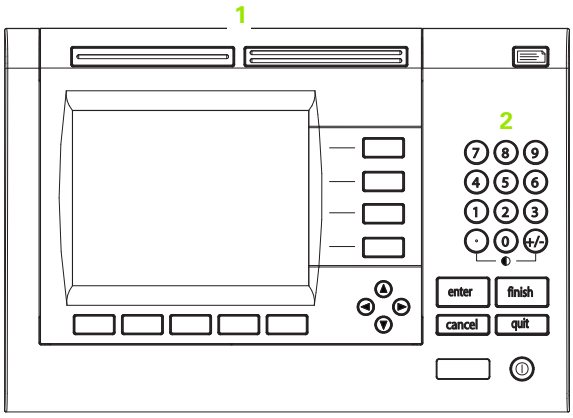
Arrow number	Descriptions
1	Wide keys
2	Unit keys
3	Remote keys
4	Foot switch 1
5	Foot switch 2

The remote foot switch and keypad are optional accessories that are purchased separately.

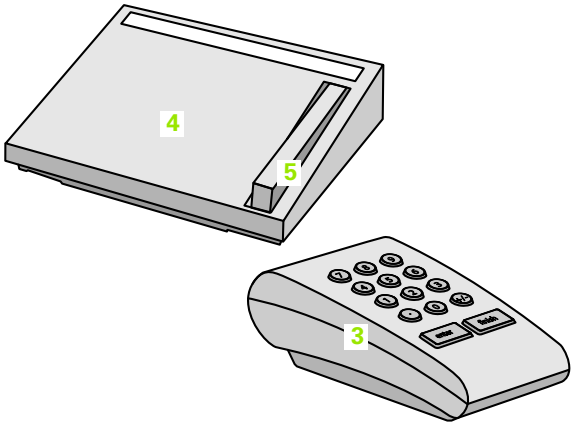
Hot keys screen

The Hot Keys screen configuration fields include:

- Key type or switch type
- Specific key or switch for hot key assignment
- Function to assign to the key or switch



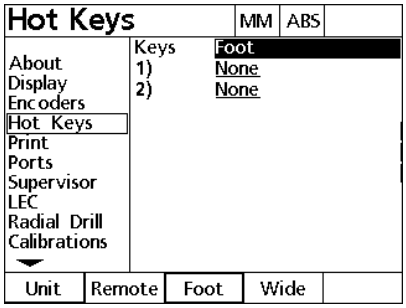
Front panel keys available for hot key mapping



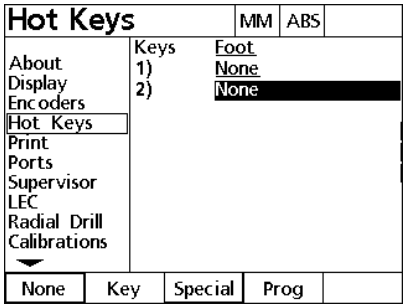
Remote keys and switches available for hot key mapping

To assign a function to a hot key:

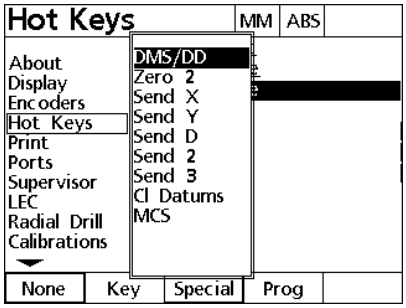
- Press MENU>SETUP to display the setup menu and then highlight the Hot keys menu item.
- Highlight the Keys choice field and then press a soft key to select the desired key type or switch type. In this example the Foot switch type is selected.
- Highlight a specific key or switch. In this example foot switch 2 is selected.
- Press a soft key to select a function type to assign. In this example a Special function will be assigned.



Press a soft key to select a key or switch type

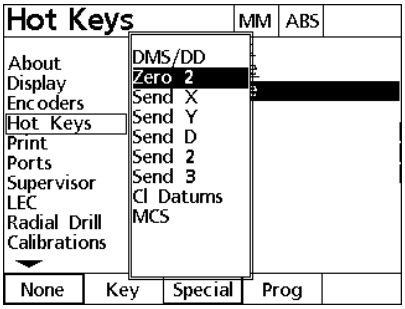


Highlight a specific key or switch for assignment

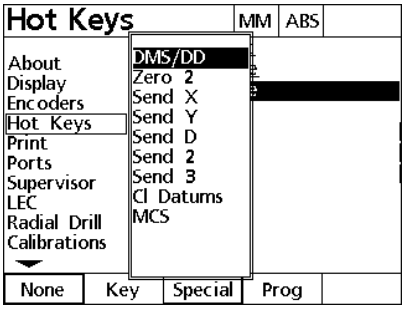


Press a soft key to select a function type

▶ Highlight the specific function and press the ENTER key to complete the assignment. In this example the Zero 2 function is assigned to foot switch 2. After the assignment, pressing foot switch 2 will zero the X and Y axes.



Highlight a specific function to assign



Press the ENTER key to complete the assignment

▶ Press the FINISH key to return to the setup menu.

The functions contained in the Special menu are shown here:

Special menu function	Description
DMS/DD	Toggles the display of angles between degrees, minutes and seconds and decimal degrees.
Zero 2	Zeroes the X and Y axes
Send X	Sends the current X-axis data to a printer or computer.
Send Y	Sends the current Y-axis data to a printer or computer.
Send Z	Sends the current Z-axis data to a printer or computer.
Send D	Sends the current diameter data to a printer or computer.
Send 2, 3, 4	Sends the current X-Y, X-Y-Z or X-Y-Z-D axes data to a printer or computer.
Clr Datums	Clears the datums
MCS	Clears datums and reestablishes machine coordinates.

Print formatting

Print formatting data and choice fields are contained in the Print screen.

Print screen

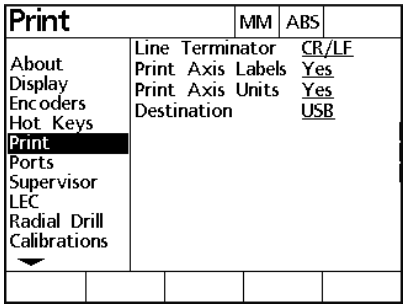
The Print screen configuration fields include:

- Line Terminator type
- Printing of axis units and labels
- Sending of data via the RS-232 or USB port

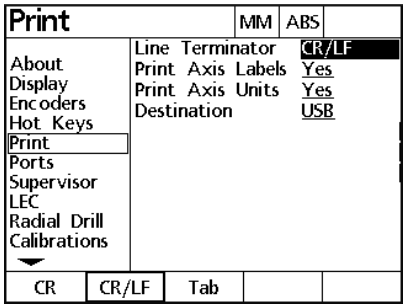
▶ Press MENU>SETUP to display the setup menu and then highlight the Print menu item.

▶ Highlight the Line Terminator choice field and then press a soft key to select a carriage return (CR) or carriage return/line feed (CR/LF) to terminate each line of data sent to a computer or printer.

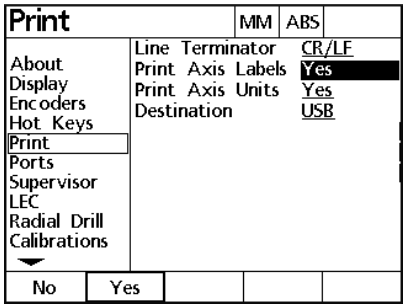
▶ Highlight the Print Axis Labels choice field and press the YES or NO soft key to include or exclude axis labels in data sent to a computer or printer.



Highlight the Print menu

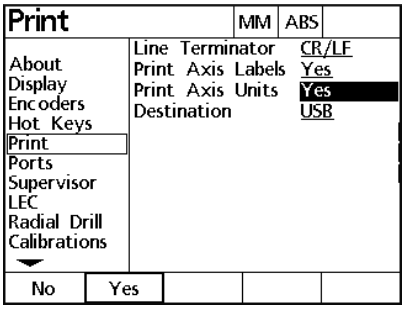


Select a line terminator

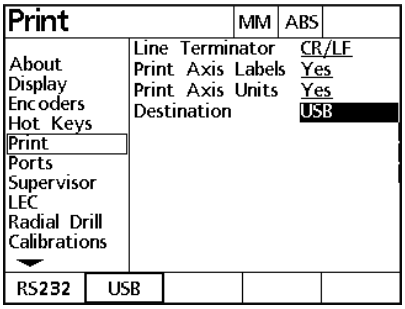


Press a soft key to enable or disable printing of axis labels

- Highlight the Print Axis Units choice field and press the YES or NO soft key to include or exclude axis units in data sent to a computer or printer.
- Highlight the Destination choice field and then press a soft key to select the RS-232 or USB port to send data to.



Press a soft key to enable or disable printing of axis units



Select a destination

- Press the FINISH key to return to the setup menu.

Port configuration

The Ports screen contains data and choice fields for configuring communication parameters of the RS-232 serial port and the USB port.

Ports screen

The Ports screen configuration fields include:

RS-232

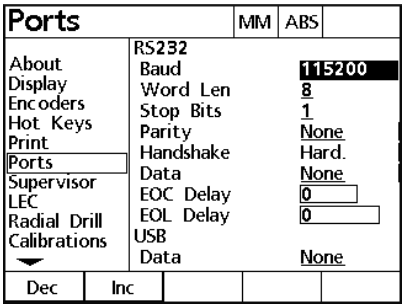
- Baud rate
- Word length
- Stop bits
- Parity
- Type of data sent on the serial port
- End of character and end of line delay

USB

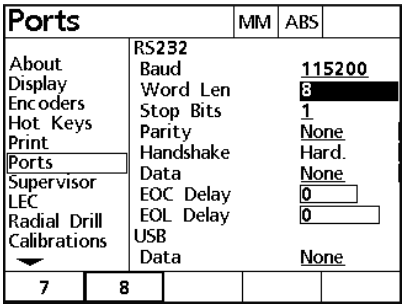
- Type of data sent on the USB port

To configure ports:

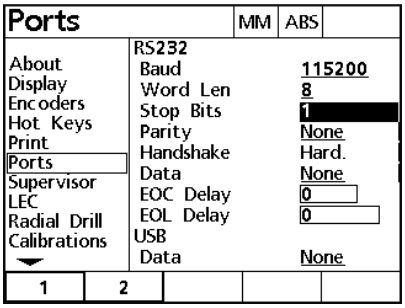
- Press MENU>SETUP to display the setup menu and then highlight the Ports menu item.
- Highlight the Baud choice field and then press a soft key to increase (INC) or decrease (DEC) the baud rate.
- Highlight the Word Len choice field and press a soft key to select a 7 or 8 bit word length.
- Highlight the Stop Bits choice field and press a soft key to select 1 or 2 stop bits.



Press the DEC or INC soft key to decrease or increase the baud rate

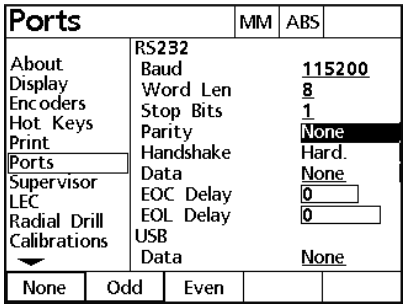


Press a soft key to select a 7 or 8 bit word length

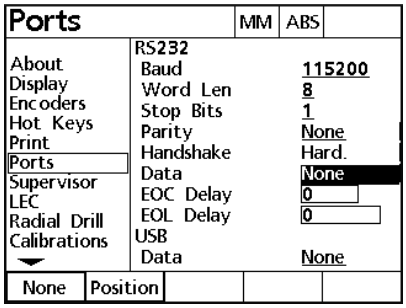


Press a soft key to select 1 or 2 stop bits

- Highlight the Parity choice field and press a soft key to select ODD, EVEN or NONE.
- Highlight the Data choice field and press a soft key to select the data to be printed using the RS-232 port. Data choices include:
  - None: No data will be sent
  - Position: Current position

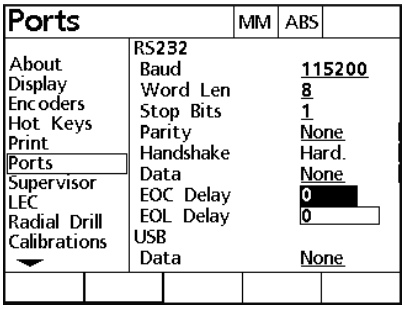


Press the ODD or EVEN soft key to select parity

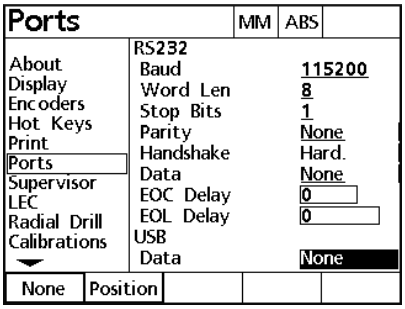


Press the NONE or POSITION soft key to select an RS-232 data choice

- Highlight the EOC (end of character) Delay and EOL (end of line) Delay data fields and enter any delays in milliseconds that might be required to optimize RS-232 communication negotiations with external devices.
- Highlight the USB Data choice field and press a soft key to select the data to be printed using the USB port. Data choices include:
  - None: No data will be sent
  - Position: Current position



Enter an EOC or EOL delay



Press the NONE or POSITION soft key to select a USB data choice

- Press the FINISH key to return to the setup menu.

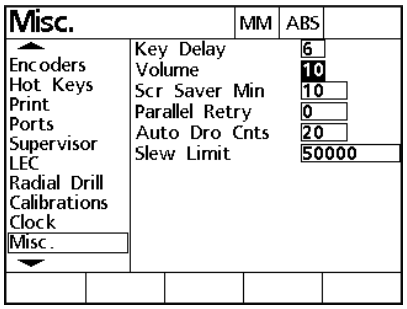
Audio volume

An audible beep is emitted by the ND 1200R when a front panel key is pressed.

Misc screen

The Misc screen contains a data field for adjusting the volume of sounds. To adjust the volume:

- Press MENU>SETUP to display the setup menu and then highlight the Misc menu item.
- Highlight the Volume data field and enter a value between 0 and 10. A value of zero will disable sounds.



Enter a value to adjust the volume

- Press the FINISH key to return to the setup menu.

Key repeat rate adjustment

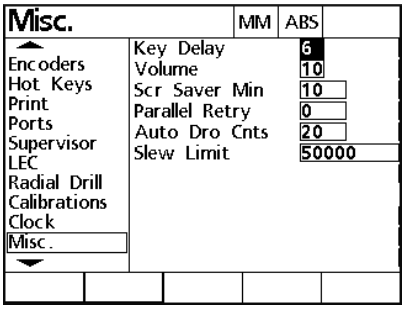
When a front panel key is pressed and held, the function repeats. The auto-repeat rate for front panel keys can be adjusted.

Misc screen

The Misc screen contains a data field for adjusting key repeat rate. To adjust the key repeat rate:

- Press MENU>SETUP to display the setup menu and then highlight the Misc menu item.
- Highlight the Key Delay data field and enter a value between 5 and 25. Enter small values for fast repetition or large values for slow repetition.

Values smaller than 5 and larger than 25 can make the keyboard difficult to use and should be avoided.



Enter a value to adjust key repeat rate

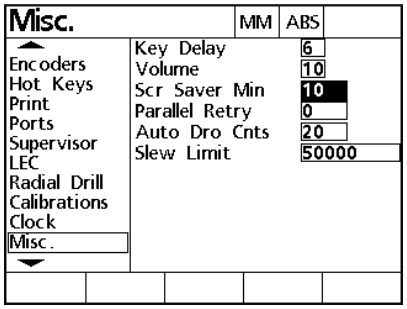
- Press the FINISH key to return to the setup menu.

Screen saver activation

Misc screen

The Misc screen contains a data field for adjusting idle time required prior to the activation of the screen saver. To adjust the screen saver activation time:

- Press MENU>SETUP to display the setup menu and then highlight the Misc menu item.
- Highlight the Scr Saver Min data field and enter the number of minutes the ND 1200R is idle prior to activation of the screen saver. The screen saver is disabled if a value of 9999 is entered.



Enter the minutes the DRO is idle prior to screen saver activation

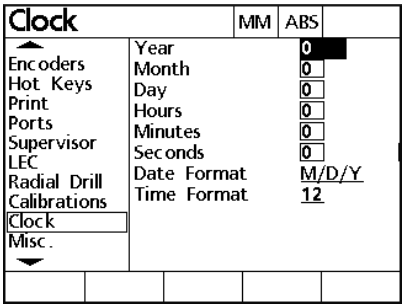
- Press the FINISH key to return to the setup menu.

Time and date settings

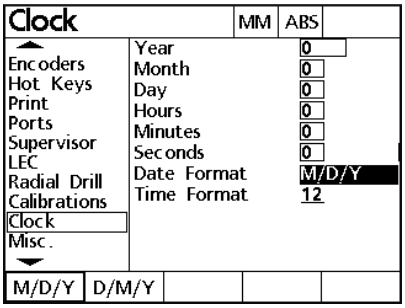
Clock screen

The Clock screen contains data fields for setting the time and date. To set the time and date:

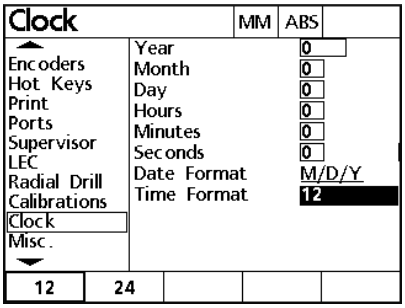
- Press MENU>SETUP to display the setup menu and then highlight the Clock menu item.
- The date and time are set using the same method: Highlight a date or time data field and enter the value.
- Highlight the Date Format choice field and press a soft key to select the desired format.
- Highlight the Time Format and press a soft key to select the 12 hour or 24 hour time format.



Enter date and time values



Select a date format



Select a time format

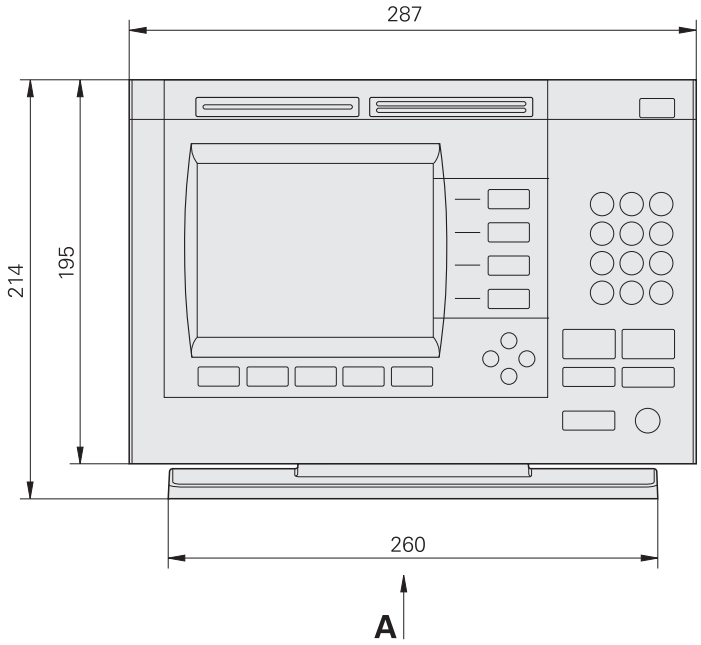
- Press the FINISH key to return to the setup menu.

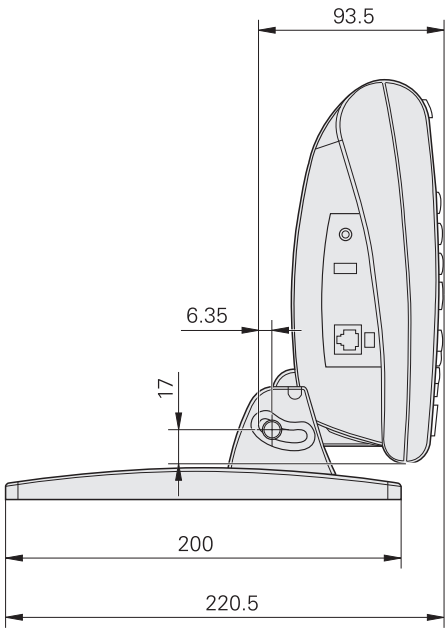
2.4 Specifications

Specifications	
Axes	2 to 3 axes
Encoder inputs	■ Linear and rotary encoders ■ Analog 1 V_{PP} ■ TTL
Display	Black and white LCD ■ 5.7″ (14.48 cm) ■ 0.50″ (1.27 cm) display digit size ■ 0.000004″ (0.00001 mm) Resolution
Error compensation	Linear (LEC)
Data interfaces	Serial interfaces ■ RS-232-C ■ USB 2.0 Type A Full-speed
Optional accessories	■ Remote foot switch ■ Remote keypad ■ ND 1200R Protective cover ■ QC-Wedge communication software
Main power input	AC 100 V ... AC 240 V (-15 % ... +10 %) 50 Hz ... 60 Hz (±2 %)
Line fuse	T1.6 A, 250 V, 5 mm X 20 mm
ENC testing	■ EN61326: 1998 EMC for electrical equipment for measurement, control and laboratory use ■ EN61010: Safety requirements for electrical equipment for measurement, control and laboratory use
Installation category	II
Environmental	■ Temperature: 32 °F to 113 °F (0 °C to 45 °C) non-condensing ■ Relative air humidity: 90% ■ Altitude: 6562 feet (2000 meters)
Enclosure	Benchtop; cast-metal enclosure
Dimensions	■ Enclosure (W x H x D): 11.5″ X 7.5″ X 2.75″ (29.21cm X 19.05 cm X 6.99 cm) ■ Base (W x H x D: 10″ X 2″ X 7.8″ (25.4 cm X 5.8 cm X 19.81 cm)
Weight	■ Enclosure: 3.5 lbs (1.6 kg) ■ Base: 7 lbs (3.2 kg)

Dimensions

The ND 1200R enclosure, tray stand and arm mount bracket dimensions are shown in the format: mm.





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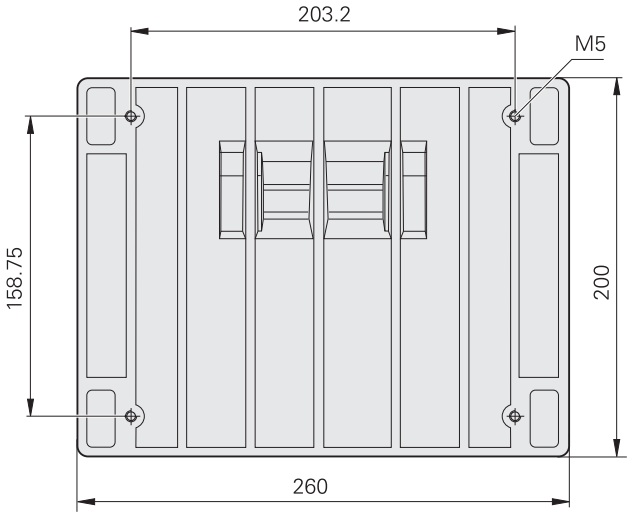
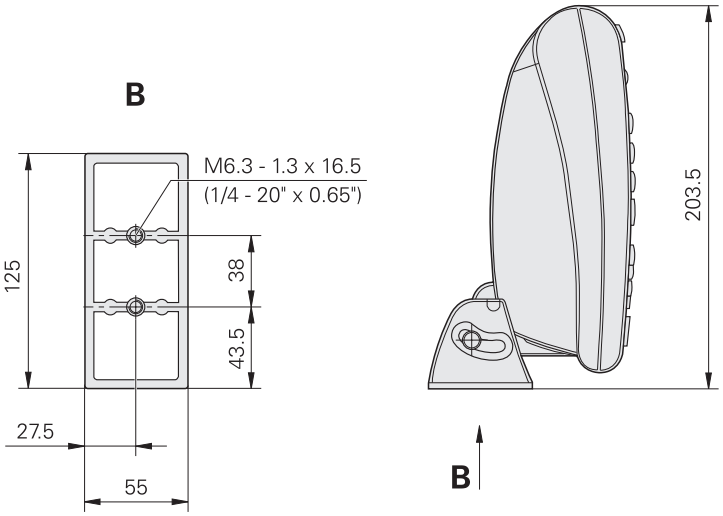


Arm mount bracket



2.4 Specifications

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