LEAD BY NOSE
User's Manual

Catalog No. 100052

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What is Lead by Nose?

As the name implies, Lead by Nose is a method of teaching a path to the **SCORBOT-ER V / ER V$_{plus}$** robot by physically manipulating its arm along that path. During this movement the controller constantly records positions at set time intervals. When the moving and recording are finished, the robot can repeat the trained path as often as instructed. The LBN method may be used for teaching tasks in specific applications such as spray painting.

Contents of the LBN Package

■ **LBN** Interface box with attached interface cable

■ **LBN** diskette

■ **LBN** Operating Instructions

Other Products Required to Run LBN

■ **SCORBOT-ER V** or **SCORBOT-ER V$_{plus}$**

■ **ATS** (Advanced Terminal Software)

Steps for Using LBN to Teach a Path to SCORBOT

1.   Load ATS onto the system.

2.   Connect the LBN interface box.

3.   Home the robot.

4.   Load the LBN software, using the ATS Backup Manager.

5.   Run the LBN program to teach the path to the robot.

6.   Run the MLBN program to repeat the robot's path.

Detailed Operating Instructions

Loading ATS

1.   Power on the controller.

2.   Boot your computer using a DOS diskette. If you are using an IBM PS/2, you must use DOS 3.3 or later.

3.   Place the ATS diskette into one of your computer's disk drives, and make sure the DOS prompt shows that disk drive.

2.   Type: `GO`

Connecting the LBN Interface Box

Refer to the diagram below.

1. Press the switch on the LBN interface box to the Motors On position.

2. Disconnect the robot cable from the back of the controller, and plug it into the socket on the front of the LBN box.

3. Plug the LBN box's cable into the robot cable socket on the back of the controller.

Lead
by
Nose

Motors
On

CONTROLLER
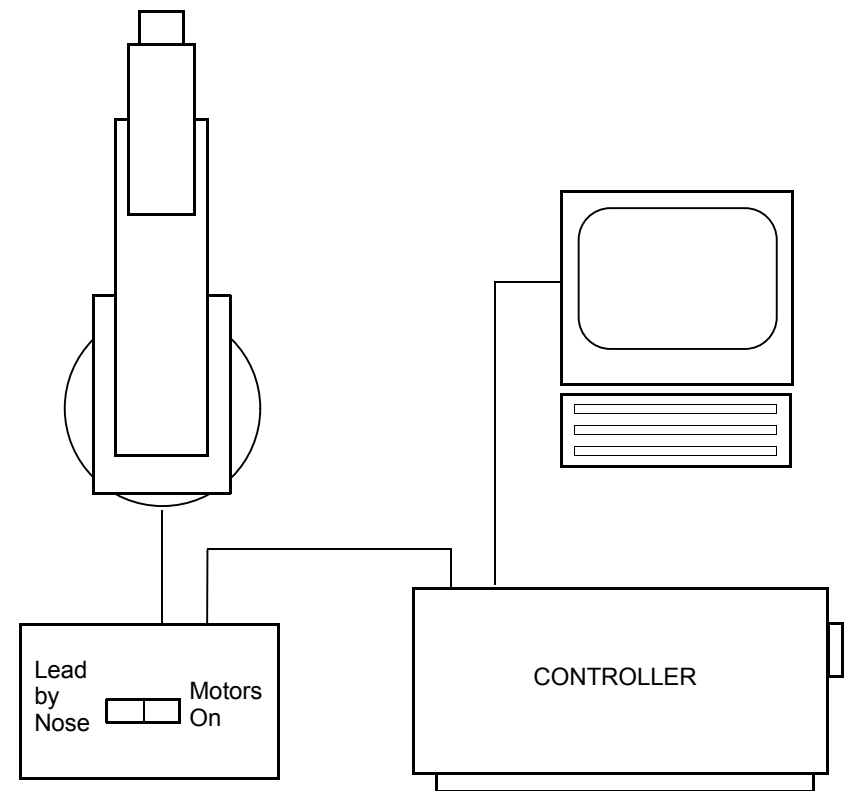
Homing the Robot

1.   From the ATS Main screen, type: HOME

2.   The homing is complete when you see the message:

        HOMING COMPLETE

        If you receive the message:

        AXIS FAILURE #__
        refer to the **SCORBOT** *User's Manual* to remedy the
        problem.

Loading the LBN Software

1.   From the ATS main screen, press <Shift>+F10 to activate the Backup Manager screen.

Use the <Enter> key to move between option lines, and use the left arrow <←> and right arrow <→> keys to highlight the field you want to activate.

If you have any positions, programs or parameters in the controller, it is advisable to back them up to disk(ette) before continuing.

2.   If necessary, change the backup directory path, to show where the LBN software is located.

3.   Enter LBN for the File Name.
Select PROGRAMS for Backup/Restore.
Select ADD TO for During Restore.

The Backup Manager screen now appears as follows:

```
                          ┌ BACKUP MANAGER ┐
     Backup directory:B:_____

     Backup / Restore : ALL / PROGRAMS / POSITIONS / PARAMETERS

     During restore : ADD TO / ERASE  controller content.

     File name : LBN_____
      ┌─────────────────────┐  ┌───────────────────────────┐
      │ BACKUP   to disk (f3)│  │                           │
      └─────────────────────┘  │                           │
      ┌─────────────────────┐  │                           │
      │ RESTORE from disk(f5)│  │                           │
      └─────────────────────┘  │                           │
      ┌─────────────────────┐  │                           │
      │   DELETE       (f7) │  │                           │
      └─────────────────────┘  │                           │
      ┌─────────────────────┐  │                           │
      │   CATALOG      (f9) │  │                           │
      └─────────────────────┘  │                           │
      ┌─────────────────────┐  │                           │
      │    EXIT     <ESC>   │  │                           │
      └─────────────────────┘  └───────────────────────────┘
```
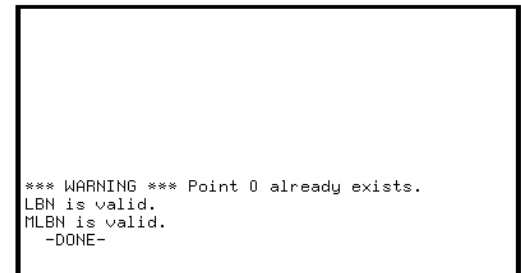
5.   Press F5 for Restore.

6.   When you see the prompt:

    ARE YOU SURE(Y/N)? N

Press Y to begin loading LBN.

The LBN file will now be loaded.

During the loading, you will see another warning that Point 0 already exists. Do not be alarmed. This refers to the robot's Home position.

```
*** WARNING *** Point 0 already exists.
LBN is valid.
MLBN is valid.
  -DONE-
```

7.   When you see the message   -DONE-
     press <Esc> to return to the ATS main screen.

Setting up the LBN Program

1. Type: RUN LBN
    The LBN program is now activated.

2. You are now prompted to define the frequency of position recording during the Lead by Nose movement.

    SPECIFY SCAN TIME (in 1/100 of a second)?

    For example, if you enter 10, positions will be recorded every tenth of a second (10/100) during the Lead by Nose movement.

3. You are now prompted to specify the duration of the Lead by Nose movement.

    SPECIFY LEAD BY NOSE RECORDING TIME
    (maximum 50 seconds)?

    For example, if you enter 25, you will be allowed 25 seconds in which to record the positions along the path. If your Scan Time intervals are tenths of a second, up to 250 positions will be recorded.

    The maximum time allowed for the Recording Time varies according to your definition of the Scan Time. LBN allows a maximum of 500 positions to be recorded. For example, if you specify the Scan Time as 100/100 (that is, intervals of one second), LBN will allow you to record for 500 seconds.

    Once you have entered times, LBN disables servo control of the motors.

```
                Advanced Terminal Software   version 1.33  (C) ESHED ROBOTEC

 >run lbn
   QUIET
 Done.
 >
  ---  LEAD  BY  NOSE   version 1.1  ---
 SPECIFY SCAN TIME (in 1/100 of a second) ?10
 SPECIFY LEAD BY NOSE RECORDING TIME (maximum  50 second) ?25

 CONTROL DISABLED.
 >MOVE SWITCH ON BOX TO 'LBN' POSITION
 PRESS <ENTER> TO START..




   <Shift+F10> Backup , <Shift+F8> Hard copy , <Shift+F9> Exit , <Alt+H> Help
 1con↓    2coff↓   3home↓   4run     5move    6move↓   7teach   8here    9dir↓    0edit
```

5.   Press the switch on the LBN box to the Lead By Nose
        position.

        When operating in the Lead by Nose mode, power to the
        robot's motors is cut off, but the encoders continue to
        function.

Teaching the Path

1.   Press <Enter> to start the recording.

2.   Grasp the robot arm, and manually move it along the path you want to record.

3.   Exclamation points will run across the screen during the record time. When they stop, the program has completed the recording.

4.   The screen will now display:

> RECORDING COMPLETE
> MOVE SWITCH TO 'Motors On' POSITION
> PRESS <ENTER> TO RESUME CONTROL

5.   Press the switch on the LBN box to the Motors On position. This restores power to the robot's motors.

6.   Press <Enter>.

```
           Advanced Terminal Software   version 1.33  (C) ESHED ROBOTEC

>run lbn
  QUIET
Done.
>
 ---  LEAD  BY  NOSE   version 1.1  ---
SPECIFY SCAN TIME (in 1/100 of a second) ?10
SPECIFY LEAD BY NOSE RECORDING TIME (maximum  50 second) ?25

CONTROL DISABLED.
>MOVE SWITCH ON BOX TO 'LBN' POSITION
PRESS <ENTER> TO START..G
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!
RECORDING COMPLETE
MOVE SWITCH TO 'Motors On' POSITION
PRESS <ENTER> TO RESUME CONTROL



  <Shift+F10> Backup , <Shift+F8> Hard copy , <Shift+F9> Exit , <Alt+H> Help
1con↓    2coff↓   3home↓   4run    5move   6move↓  7teach  8here   9dir↓   0edit
```

Repeating the Recorded Path

1.   In order to cause the robot to repeat the path which you have just recorded, type: RUN MLBN

2.   You can repeat the program as often as you wish by again typing: RUN MLBN

      The screen display will be as follows during the execution of the MLBN program.

```
              Advanced Terminal Software   version 1.33  (C) ESHED ROBOTEC
 ┌──────────────────────────────────────────────────────────────────────┐
 │                                                                        │
 │                                                                        │
 │                                                                        │
 │                                                                        │
 │ O.K.                                                                   │
 │ >RUN PROGRAM 'MLBN'TO PLAY RECORDED SEQUENCE                           │
 │ run mlbn                                                               │
 │ Done.                                                                  │
 │ >                                                                      │
 │ MOVING TO STARTING POSITION                                           │
 │   QUIET                                                                │
 │ CONTROL ENABLED.                                                       │
 │ >                                                                      │
 │ PLAYING SEQUENCE..                                                    │
 │ PLAYING COMPLETE                                                       │
 │                                                                        │
 │ >                                                                      │
 └──────────────────────────────────────────────────────────────────────┘
     <Shift+F10> Backup , <Shift+F8> Hard copy , <Shift+F9> Exit , <Alt+H> Help
 1con↓    2coff↓  3home↓   4run    5move   6move↓  7teach  8here   9dir↓   0edit
```

Using Lead By Nose
for Your Own Applications

Recording Positions in a Vector

To define and record a path which you can save for later use, follow the steps below.

1.   First write your own program based on the sample given here. These are the commands that will allow you to record a vector using the LBN interface box. You may want to refer to the Lead By Nose Program Listing at the end of this manual.

Sample User Program for Recording Positions

```
DIMP NOSEV[200]

 PROGRAM MYNOS
 ****************

 DEFINE N
 @  COFF

 HERE     VNOSE[1]
 FOR N=2 TO 200
  DELAY   10
  HERE    VNOSE[N]
 ENDFOR

 @  CON
```

DIMP: defines a position vector.

DEFINE: defines a local variable.

FOR N=2 to 200: defines the range of positions to be recorded.

DELAY: defines the Scan Time intervals, in hundreths of a second. (In this example, the delay equals a tenth of a second; therefore, it will take 20 seconds to record 200 positions.)

HERE: records the current position.

COFF and CON: disconnect and reconnect servo control to the axes before and after the Lead By Nose movement.

2.   Make sure the LBN interface box is properly connected.
        Make sure the robot has been homed.
        Make sure the switch on the LBN box is set to Lead by Nose.

3.   From the ATS main screen, type: RUN MYNOS

        Grasp the robot arm and move it along the path you want to record. Positions will be recorded for 20 seconds.

4.   If you want to save these positions for later use, use the ATS Backup Manager.

        Note: Once you have saved the LBN positions, you do not need the LBN interface box to run the programs in which they are used.

Using Your LBN Vector

The following program lines can be saved and integrated into any robot application program.

Your application can even include several different vectors which were recorded with Lead By Nose.

Sample User Program for Position Playback

```
PROGRAM RUNOS
***************


MOVED     VNOSE[1]
@  MPROFILE TRAPEZE A
MOVESD    VNOSE 2 200 2000
@  MPROFILE PARABOLE A
```

MOVESD: movement through path begins at vector position 2 and ends at position 200, and takes 2000 hundredths of a second to complete.

PROFILE: the robot movement profile is set to trapezoid, to ensure a constant speed during movement through the vector. This is especially important for applications such as spray painting and welding, which require steady and even movements.

Lead By Nose Program Listing

```
        PROGRAM   LBN
        *********************
@  QUIET
DELAY    2
PRINTLN   " -- LEAD  BY  NOSE   version 1.1  --"
PRINTLN   "SPECIFY SCAN TIME (in 1/100 of a second)"
READ      DLBN
IF       DLBN = 0
  SET      DLBN = 20
ENDIF
IF       DLBN < MLBN
  SET      DLBN = MLBN
ENDIF
SET      I=5 * DLBN
PRINTLN   "SPECIFY LEAD BY NOSE RECORDING TIME "
PRINT     "(maximum "  I " second)"
READ      TLBN
PRINTLN
IF       TLBN > I
  ORIF     TLBN = 0
  SET      TLBN = I
ENDIF
SET      TLBN=TLBN * 100
SET      PLBN=TLBN / DLBN
@  COFF
PRINT     "MOVE SWITCH ON BOX TO 'LBN' POSITION"
PRINTLN    "PRESS <ENTER> TO START.."
LABEL    1
GET      I
```

```
IF      I <> 13
 GOTO     1
ENDIF
PRINTLN
HERE     LBN[1]
FOR      I = 2 TO PLBN
 PRINT     "!"
 DELAY     DLBN
 HERE     LBN[I]
ENDFOR
PRINTLN    "RECORDING COMPLETE"
PRINTLN    "MOVE SWITCH TO 'Motors On' POSITION"
PRINTLN    "PRESS <ENTER> TO RESUME CONTROL"
PRINTLN
LABEL    2
GET      I
IF      I <> 13
 GOTO     2
ENDIF
DELAY    10
@  CON
@  NOQUIET
PRINT     "RUN PROGRAM 'MLBN'"
PRINT     "TO PLAY RECORDED SEQUENCE"
PRINTLN
END
```

```
                    PROGRAM   MLBN
                    ********************
DELAY     1
PRINTLN    "MOVING TO STARTING POSITION"
@  QUIET
DELAY     10
@  CON
DELAY     10
MOVED     LBN[1]
@  MPROFILE TRAPEZE A
DELAY     10
PRINTLN    "PLAYING SEQUENCE.."
MOVESD    LBN 2 PLBN TLBN
PRINTLN    "PLAYING COMPLETE"
PRINTLN
@  MPROFILE PARABOLE A
@  NOQUIET
END
(END)
```