

Mint^{Multi-Tasking} MT Application Note**AN00123 - Connecting NextMoveESB to a MicroFlex Drive
in Speed Mode****Related Applications or Terminology**

- **Drive Operation Modes – Current / Speed / Pulse and Direction**
- **Drive Configuration**
- **Speed Loop Tuning**
- **Position Loop Tuning**

References

- **MN1919 – MicroFlex Installation Manual**
- **MN1924 – NextMoveESB Installation Manual**
- **AN00124 – Connecting NextMoveESB to a MicroFlex in Current Mode**
- **AN00125 - Connecting NextMoveESB to a MicroFlex using Pulse and Direction**

Overview

This application note is one of three which together describe the interconnection options for using a NextMoveESB and a MicroFlex drive, together with a description of how to configure the motion controller and the drive to get simple motion using the different configuration modes.

There are three different modes of operation available in a MicroFlex drive; Current , Speed and Pulse and Direction. Each mode is configured in a different way using different tuning techniques. These differences and the benefits of each are described in these documents. This Application Note concentrates on Speed mode operation.

The purpose of this application note is to get a system operational “on the bench”, without a load connected to the motor. Some additional comments are added at the end to assist with tuning a loaded motor.

Supported Controllers

NextMovePCI	<input type="checkbox"/>
NextMoveBX^{II}	<input type="checkbox"/>
NextMoveST	<input type="checkbox"/>
NextMoveES	<input type="checkbox"/>
NextMoveESB	<input checked="" type="checkbox"/>
MintDrive^{II}	<input type="checkbox"/>
Flex+Drive^{II}	<input type="checkbox"/>
FlexDrive^{II}	<input type="checkbox"/>
MicroFlex	<input checked="" type="checkbox"/>

Mint^{MT} Multi-Tasking Application Note

NextMoveESB Controller

The NextMoveESB is a programmable 7 axis controller capable of controlling up to 3 axes of servo and 4 axes of stepper.



The unit is programmed using the versatile language MintMT which provides a comprehensive set of motion instructions for creating motion control programs for many types of application.

This controller provides a very cost effective solution to multi axis control applications.

NextMoveESB has both a RS232 serial port and a USB port. Using the USB port will allow communications to both the controller and the drive simultaneously if the PC only has one RS232 port.

MicroFlex Drive



MicroFlex is a sophisticated servo drive which has been designed to meet the requirements of multi-axis systems without additional unnecessary features to provide high performance in an economical unit.

The combination of the NextMoveESB and MicroFlex drives is an ideal solution to many machine applications and are ideal components for machine builders.

Mint^{Multi-Tasking} MT Application Note

Speed Control

A drive in Speed mode can be used simply to control the speed of a motor, but more typically it is used in combination with a motion controller to control the position of the motor. It is most common to use Speed mode for position controlled systems as it provides a good dynamic response, a reduced risk of erratic behaviour and makes the position loop is far easier to tune for the majority of cases.

A Speed control drive also contains a current controller. The drive receives a speed demand via its analog input which is converted into a current demand by the speed controller. The current loop then drives current into the motor causing it to accelerate or decelerate.

The Speed controller is a closed control loop which requires feedback from the motor. A transducer fitted to the motor generates a signal which is used to determine the actual speed of the motor. Any difference between this and the demanded speed causes a demand on the current controller which in turn causes the motor to react to close the gap. Each of these control loops has some associated gain terms, each of which require tuning to the system load conditions.

When a motion controller is added to the system an additional control loop has to be considered, the position loop. This also requires suitable feedback which is generated by the motor transducer, fed back to the drive and then on to the motion controller. The position loop also has a set of gain terms that need to be tuned.

Feedback Devices

Motor feedback is essential for accurate "closed loop" control for both the Speed and Position loops. There are a number of different feedback devices commonly fitted to motors. For a brushless AC servo system it is important that the feedback to the drive provides both absolute positional information as well as speed. The positional information is used to commutate the motor and to generate an encoder signal passed on to an external motion controller. The speed is derived by measuring the rate of change of position (differentiated).

MicroFlex is compatible with a number of different feedback devices, Hall, Encoder and SSI.

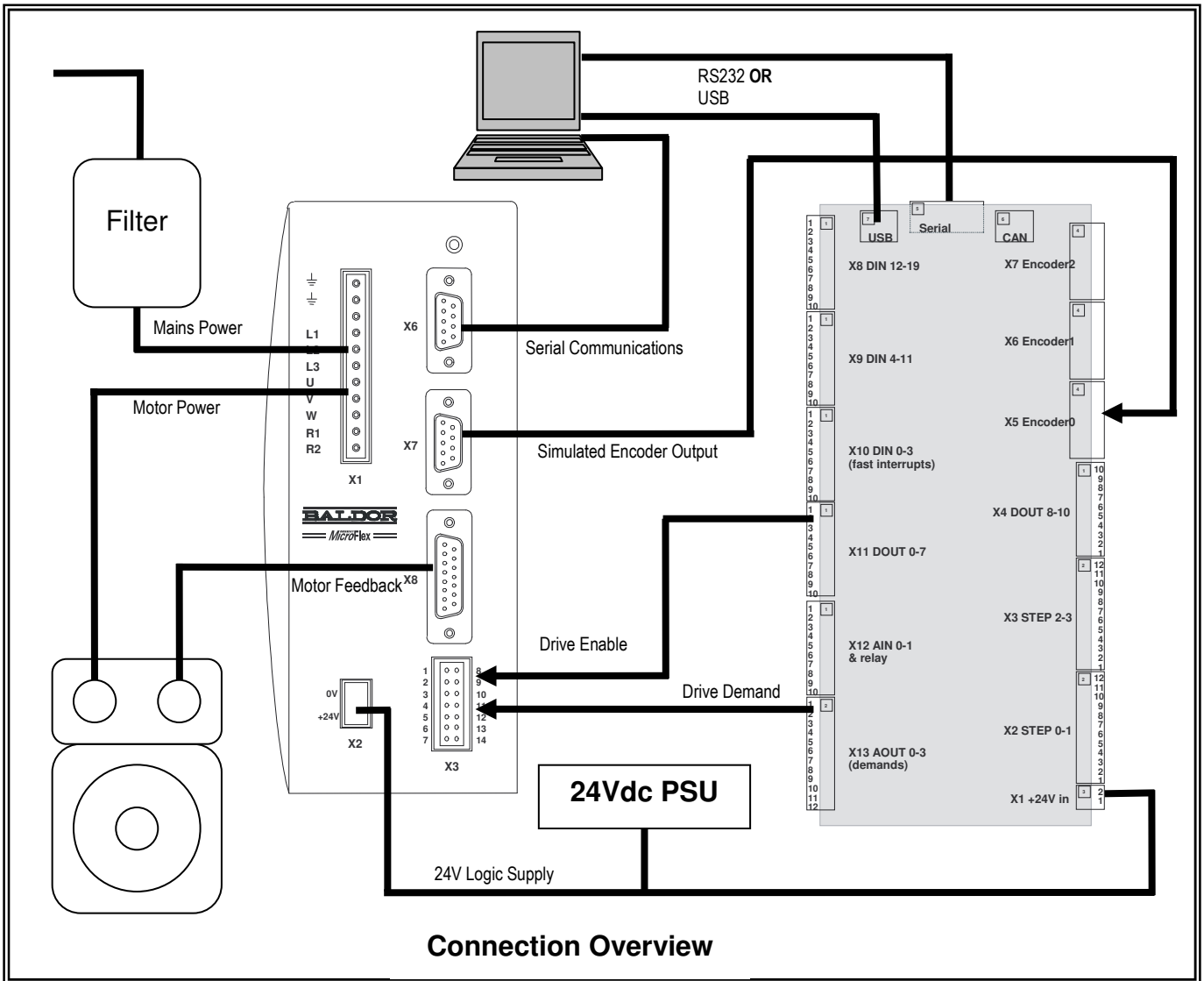
- "Hall only" feedback may be used for course control although does not generate any signals suitable for motion controllers.
- "Encoder only" requires a "phase search" sequence on power up, the drive will generate an encoder signal for use with motion controllers which is simply a buffered copy of the incoming feedback signal.
- "Encoder AND Hall" gives the same level of control and output signals as an "encoder only" set up but does not require the "phase search" sequence as absolute information is generated by the Hall device.
- "SSI feedback" provides a high resolution feedback signal that is converted into an encoder signal by electronics inside the drive, providing an output for use with motion controllers. The resolution of the simulated encoder output is adjustable using the drive configuration software.
- MicroFlex is not compatible with resolver feedback motors.

Mint^{MT} Multi-Tasking Application Note

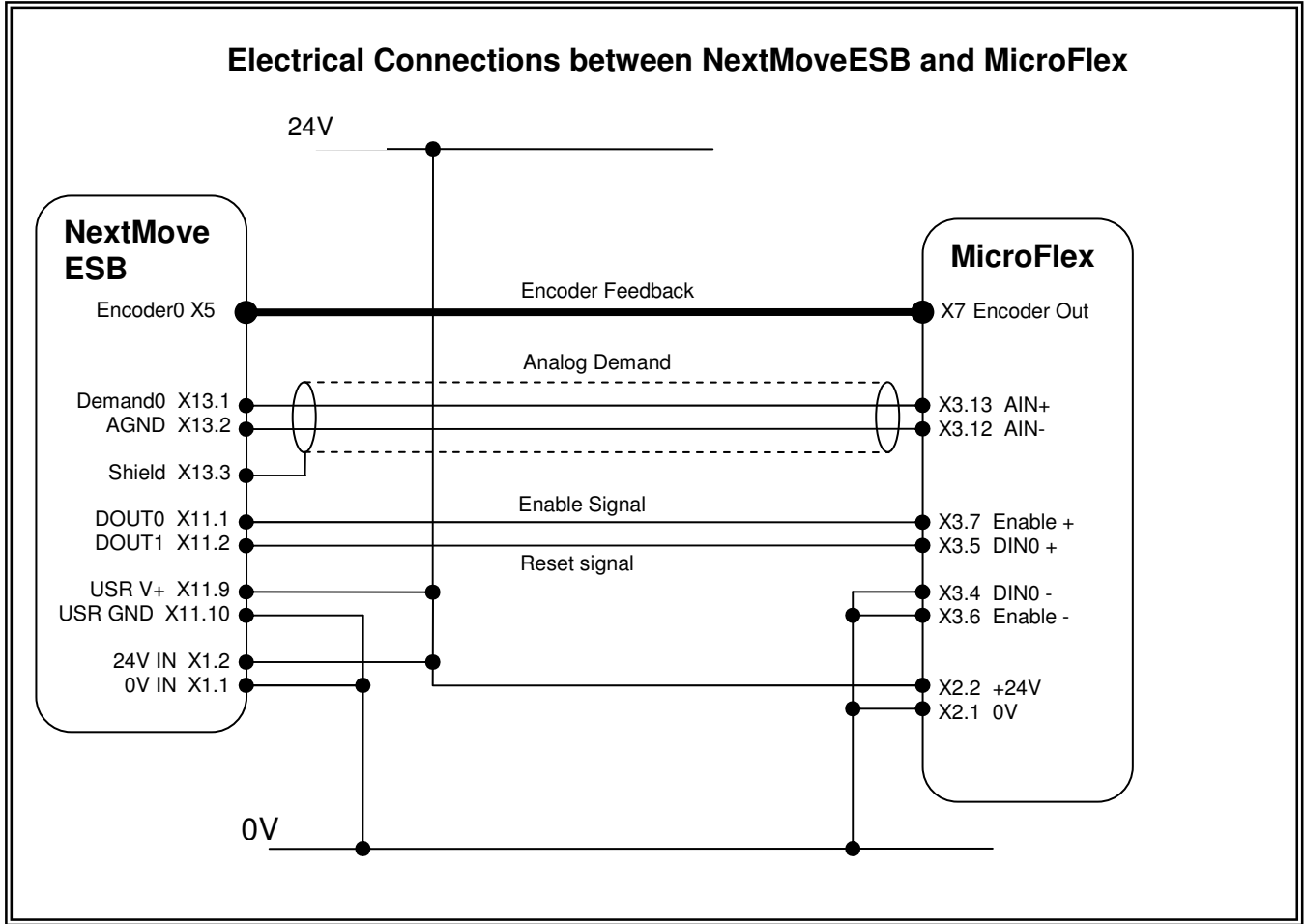
Installing a Simple Speed Drive Positioning System

Equipment Required – NextMoveESB, MicroFlex Drive, BSM motor with encoder or SSI feedback, PC running Windows 2000, XP or later, a serial cable (CBL001-501 or similar), USB or second serial cable, Motor power and feedback cables and other interconnecting cables as described below.

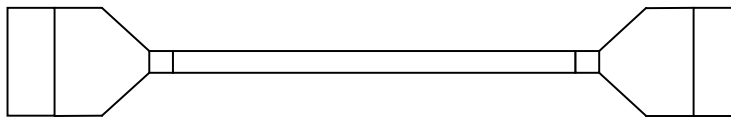
The minimum wiring configuration between drive and motion controller requires an enable signal, a demand signal and an encoder feedback signal. Mains power for the drive, 24Vdc supply for the drive and controller, a motor power cable and a motor feedback cable connections. Further details of these cables are available in the MicroFlex Installation Manual MN1919.



Mint^{MT} Multi-Tasking Application Note



Encoder Feedback Cable



NextMoveESB X5	Function	MicroFlex X7
1	CHA+	1
6	CHA-	6
2	CHB+	2
7	CHB-	7
3	CHC+ (index)	3
8	CHC- (!index)	8
5	GND	5
Clamped on shell	Screen	Clamped on shell

Mint^{MT} Multi-Tasking Application Note

Making a Communications Link

During the configuration of the MicroFlex and the NextMoveESB it will be necessary to switch the communications link between the devices. If only one serial port and no USB connection is available then a single copy of WorkBench v5 must be used; each time you need to communicate with a different device you must physically move the connection between controls, this is referred to as a single port setup. If two serial ports are available or a serial port and a USB port then two copies of WorkBench v5 can be run at the same time, this is the dual port setup.

Connecting to NextMoveESB

Make sure there is 24V power applied to the NextMoveESB and the LED status display is illuminated.

- Connect the serial or USB cable to the appropriate NextMoveESB port
- Run WorkBench v5
- Select *Start New Project*
- Choose the USB or COM port that the MicroFlex is connected to
- Click the *Scan* button
- Select the NextMoveESB when it appears in the list.
- Save the connection settings using *File > Save Project*, call the file NMESB.WBX

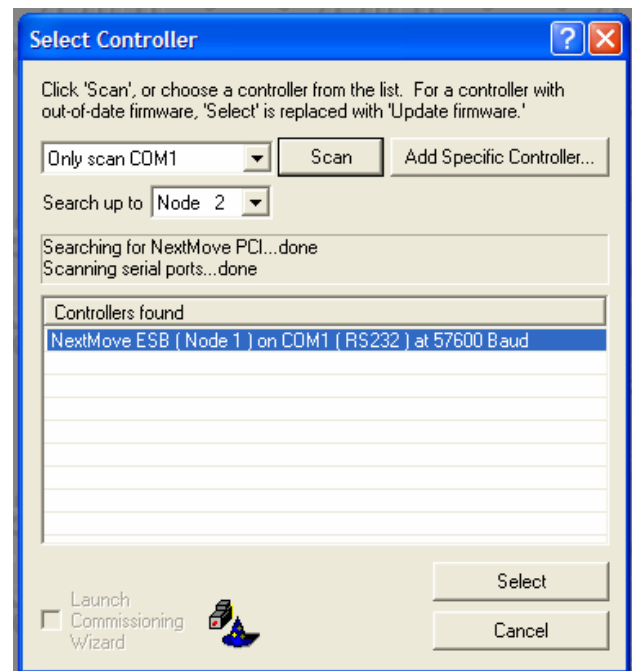
Note: WorkBench v5 project files contain information about your application, including:

- Information about the controller that is currently connected.
- Links to the program files (**.mnt** file). But NOT the actual program file.
- Other desktop details.

The project file does not contain any program code - it is contained in the separate .mnt files. Always remember to "Save File" after making any program changes.

It is important that there is no program in the NextMoveESB when configuring, as settings from a different system may cause unexpected behaviour. To delete a program, select the menu option *Program > Delete Existing*. Then select *Tools > Reset Controller* to set factory default settings.

Next we will connect to the MicroFlex so for a single port configuration close down WorkBench v5, for a dual port system keep this copy of WorkBench v5 running.



Mint^{MT} Multi-Tasking Application Note

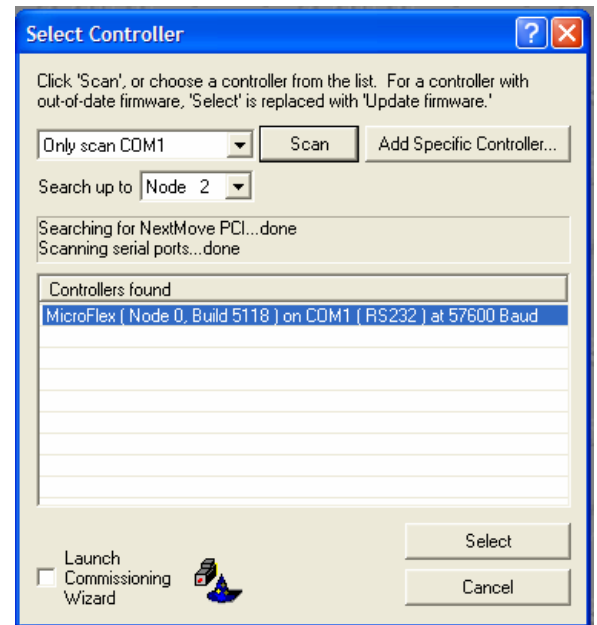
Connecting to MicroFlex

- Make sure MicroFlex has 240Vac and 24Vdc applied.
- For a single port configuration move the serial connection to the MicroFlex

Or

For a dual port system connect the serial lead between a second PC COM port and the MicroFlex connector labelled X6 or connect the USB cable.

- Run WorkBench v5
- Choose the port that the MicroFlex is connected to.
- Click the *Scan* button, MicroFlex should be detected and the connection details will appear in the list
- Make sure the *Launch Commissioning Wizard* box is checked, (the Commissioning Wizard is a tool used to display and edit many of the drive settings which can be configured one page at a time. Do NOT reselect the MicroFlex from the list.)
- Click *Select* to make the connection to MicroFlex.



Mint^{Multi-Tasking} MT Application Note

MicroFlex Commissioning Wizard

The Commissioning Wizard shows a sequence of screens displaying the appropriate drive settings and requesting information required to commission the drive. When each page is complete click the *Next* button to continue through the Wizard.

Welcome Page

The first screen describes the process and offers the opportunity to set all drive parameters to their factory setting. Make sure the Reset Factory Defaults box is checked and click the Next button.

Motor Type / Select Motor

Select the correct motor type, usually this is done using the catalogue number printed on the motor name plate. Be sure to copy the exact product code. The Spec number can also be used to identify the motor.

Feedback

Encoder motors have a fixed resolution, this cannot be changed, SSI motors have a user selectable resolution. Usually it is good to select the highest resolution available unless the application requires long travel distances or high speeds. (Refer to the help file for the limitations of distance and speed)

Operating Mode

For the operating mode select "SPEED Control"

Current Control

The Current control page settings do not normally need to be adjusted, but make yourself familiar with the parameters available for adjustment later. Pressing F1 will bring up help on these topics.

Speed Control

On the Speed control page the only parameter that generally needs to be modified is the "Application Max Speed". At this point it is necessary to have a feel for how fast the motor is required to move for the application. If you have no idea then the default speed of 3000 will be a good starting point. If the application requires a speed in excess of the value typed here then it will not be able to attain the demanded speed and a following error will probably be created. This will need correcting later and the system retuned.

Be aware that the maximum speed is limited both by the available bus voltage and the motor's physical maximum speed, therefore the speed entered at this point cannot exceed either of these two values which are displayed for your reference.

For applications that are designed to run at slower speeds it is advisable that the "Application Max Speed" is reduced to maximise on the speed resolution available, this will improve speed accuracy at lower speeds. But always set this parameter to a value slightly in excess of the maximum required to avoid unwanted errors.

For control by the NextMoveESB the "Source of Speed Demand" should be "Analog Input 0 - Profiled". This is the default value and should not need to be changed.

Mint^{Multi-Tasking} MT Application Note

Step and Direction Control

For Speed Control the Step and Direction parameters are not applicable so no need to change anything on this screen.

Digital I/O

The digital inputs should be configured to be "Level triggered", "Active High" (or set in accordance with the application's requirements)

The programmable input should be set to be the Reset Input (or set in accordance with the application's requirements)

Analog Inputs

The analog input does not normally need any parameter setting with the exception of the Offset Compensation. Click the *Offset Tune* button to activate the routine to zero the analog input. The NextMoveESB demand should be connected at this point and demanding zero speed (this is its default condition). The offset value should be a small percentage (between -1% and +1%), if not try again making sure there is no demand from the Motion Controller.

Save Settings

Remember to save the parameters when prompted to do so as MicroFlex parameters are not saved automatically. To do this manually select the menu option *Tools > Save Drive Parameters* or click the *Save* button.

At this time you can also save the connection details as a project, from the menu options select *File > Save Project*, choose a suitable folder to save the information and give it the name MicroFlex.WBX

Mint^{MT} Multi-Tasking Application Note

Switching Communication Between Devices

Throughout the configuration section of this document you will be instructed to “switch to MicroFlex” or “switch to NextMove”.

To switch with a single port system – Move the serial connector from one device to the other, in WorkBench v5 select *File > Open Project*, and select either the MicroFlex.WBX or NMESB.WBX project file to make the appropriate connection.

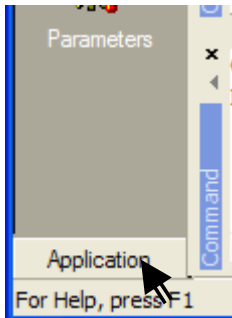
To switch using a dual port system – simply toggle to the other copy of WorkBench v5.

Tuning MicroFlex

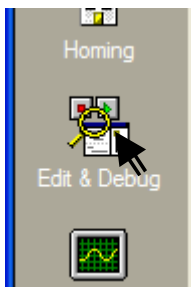
Before the tuning process can be started it is necessary to ensure that any brake fitted to the motor is released and an enable signal is provided to the MicroFlex from the NextMoveESB.

If a brake is fitted to the motor make sure 24V is applied and check that the motor shaft is free to turn. If the brake is to be controlled by the NextMove follow the instructions below for providing the enable signal, except select the appropriate output number or use the RELAY command.

Switch the communications link to the NextMove.



When connected, choose the *Application* toolbox folder on the left edge of the WorkBench window.



Click on the *Edit and Debug* icon

Mint^{MT} Multi-Tasking Application Note

Here you will find the terminal and the command line windows.



To issue single commands to the controller use the command line window and type the following:



OUTX(0) = 1 { This command provides the enable signal
OUTX(1) = 1 { Either of these commands can be used
RELAY = 1 { to release a motor brake

This will turn on digital output 0 and provide the enable signal to the MicroFlex drive. The drive may not enable immediately as it is probably software disabled at this stage but this is not a problem.

To continue with the tuning you will now need to **switch back to MicroFlex** and go back to the Autotune screen.

Mint^{MT} Multi-Tasking Application Note

Autotuning



To begin with it is always advisable to AutoTune the system with the motor disconnected from the load. This ensures that the system is functioning correctly before moving the load and reduces the risk of causing damage. This application note assumes the motor is unloaded and free to rotate in either direction.

If you are using a standard Baldor motor selected from the database and the wiring is correct, it should only be necessary to complete the recommended Autotuning steps:- Calculate current loop gains, Measure the motor inertia, Calculate the speed and position gains.

- Click the *START* button to proceed.

Once the Autotuning is complete remember to save the drive parameters when prompted.

If Autotuning fails, selecting the other tuning options may correct some simple wiring or configuration faults. If the errors continue to be generated check the wiring carefully and refer to the help files for more assistance on Autotuning errors.

Fine Tuning

Speed Control Terms	
KVPROP:	1.91
KVINT:	145.80
KVTIME:	0.00
KVTRACK:	100

Load Model	
Inertia:	0.00003737 kgm ²
Damping:	0.00016644 Nms/rad

Profile Parameters	
Accel time:	0.00 ms
Decel time:	0.00 ms

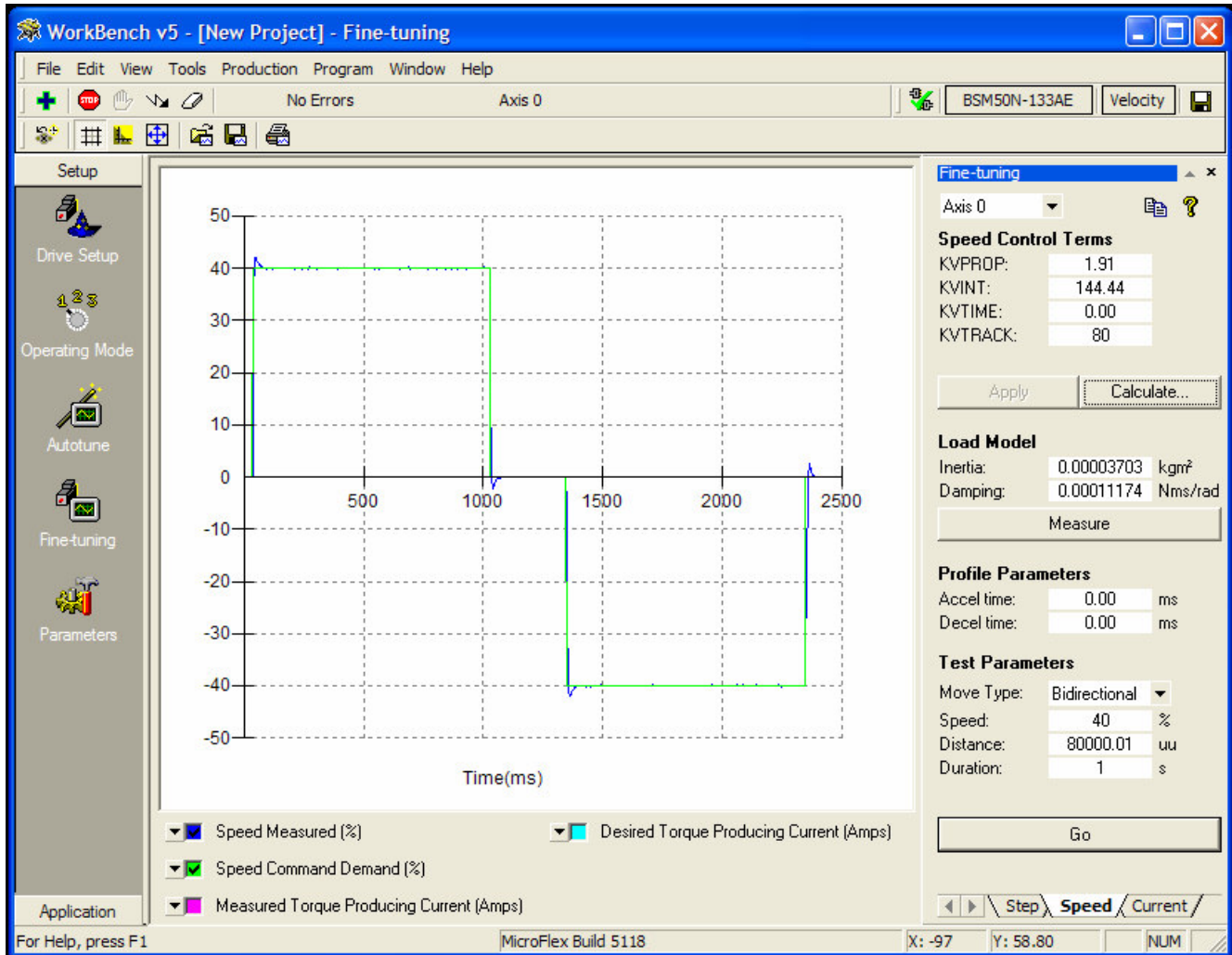
Test Parameters	
Move Type:	Bidirectional
Speed:	40 %
Distance:	80000.01 uu
Duration:	1 s

The Fine tuning screen can now be used to check the performance and modify the response if required. As the drive has been configured in Speed mode we will perform a test speed move. Make sure the *Speed* tab at the bottom right corner of the WorkBench v5 screen is selected.

A suggested test move would be to set up a bi-directional, 40% speed move for 1 second. Click the *Go* button when these parameters have been typed in and you are ready to start the move. When the move is complete and the graph is displayed look at the Speed Measured and the Speed Command Demand, hopefully these will show a reasonable match.

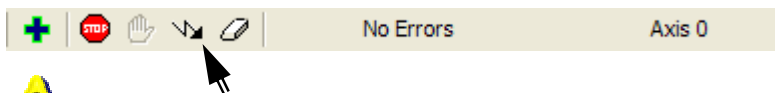
If there is some overshoot it can be easily reduced by decreasing the value of Tracking Factor (KVTRACK). Then try the move again. Other gain terms can be easily adjusted using the Calculate button and using the Bandwidth slider to increase or decrease the response of the motor. After each change to the settings try the test move again to see if there has been an improvement.

Mint^{MT} Multi-Tasking Application Note



In the example plot above the Tracking Factor has been reduced from 100 to 80 to decrease the overshoot seen at the ends of the acceleration and deceleration periods.

Once the tuning step is complete the drive is ready to be controlled by the NextMove. Make sure the drive parameters are saved (*Tools > Save Drive Parameters*). Also make sure that the drive is software enabled. To software enable the drive click the Enable icon on the toolbar.



Warning! Be aware the motor could “run off” at high speed or may drift slightly.

Do not worry about a slow drift of the motor, this is normal and will stop when the position loop is enabled. If the motor moves out of control click the Enable icon again to disable the drive, then check the connections and that a program is not running on the NextMove.

Mint^{Multi-Tasking} MT Application Note

Setting Up NextMove

Switch to NextMove.

Before we can start position loop tuning it is necessary to check that all of the connections are correct and that the signals are working in the correct sense. Using WorkBench v5 connected to NextMove select the *Edit & Debug* page and type the following instructions at the *Command Line*.

To enable the drive type the following



```
CONFIG([0,1,2,3,4,5,6]) = _cfOFF;  
CONFIG(0) = _cfSERVO  
DRIVEENABLEOUTPUT(0) = 0  
FOLERRORMODE(0) = 0  
RESETALL  
TORQUE(0) = 0
```

Axes have default connections so must be turned off before re-configuration as servo axes.

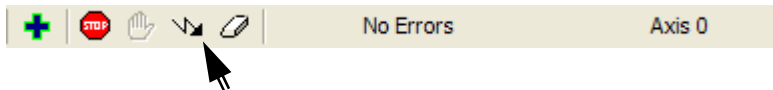
Set output 0 to be the drive enable output

Turn off following error detection

Clear any errors on all axes and enable the drive

Demand an open loop speed demand of 0

We are ready to try to move the motor, ensure there are no obstructions and that the motor is free to turn with the brake released. If the motor moves out of control be ready to click the Enable icon on the WorkBench v5 Toolbar to disable the drive.



Now type the following at the command line:



```
TORQUE(0) = 1
```

The value displayed in the Position Counter should be increasing, this indicates that for a positive demand the motor counts in a positive direction. The measured Speed should also be a positive value.

Try:



```
TORQUE(0) = -1
```

The motor should reverse its direction, Speed should have a negative value and the position counter should count down.

To stop the motor type:

```
CANCEL
```

This is an important test to do before enabling the servo loop and adding any gain values. If the direction of count is the opposite to the demand then the motor will "run off" uncontrollably. If the count is in the wrong direction then the wiring should be checked, however it is also possible to reverse the direction of the count using the following Mint command

Mint^{Multi-Tasking} MT Application Note

```
ENCODERMODE(0) = 1      'reverse encoder direction, (= 0 for forward
                           direction)
```

Reversing the Motor Direction

If the count is in the right sense but the motor is physically moving in the wrong direction for the application, the following commands can be used to reverse the motor direction:



```
DRIVEENABLE(0) = 0 'Disable drive
DACMODE(0) = 16    'reverse demand direction, = 0 for forward direction
ENCODERMODE(0) = 1 'reverse encoder direction, = 0 for forward
                           direction
DRIVEENABLE(0) = 1 'Enable drive
```

Remember it is important that the position counter counts up for a positive TORQUE value and counts down for a negative TORQUE value. The physical direction that the motor moves is not important for servo control. Always check the direction of feedback after making these changes.

To stop the motor moving type the CANCEL command.

Setting Scale Factor

To define motion in terms of useful units it is normal to set a scale factor. The scale is calculated by determining the number of encoder counts per user unit. In the case of an unloaded motor useful units would be motor revolutions (revs), in this case SCALE = number of encoder counts per rev



```
SCALEFACTOR = 4000 (for a standard encoder motor)
SCALEFACTOR = 262144 (for a SSI motor set to its maximum resolution)
```

You can set the scale factor at the command line.



Note

MintMT has an abbreviation for most of the keywords which is useful when typing at the command line as it reduces the amount of typing required. A few are listed below

```
DRIVEENABLEOUTPUT = DEO      SCALEFACTOR = SF
RESETALL = RA              DRIVEENABLE = DE
TORQUE = TQ
PRINT = ?
```

These commands, and others, are all described in more detail in the WorkBench v5 Help files. Help can be obtained by pressing F1 with the cursor positioned on a MintMT keyword in the command line.

The use of abbreviated commands is not recommended for use in a program, it makes the code very difficult to understand at a later point in time or by other people.

Mint^{MT} Multi-Tasking Application Note

Position Loop Tuning in NextMove

As there is no Autotuning facility for the position loop on NextMove controllers, the gain terms need to be either calculated or determined experimentally. The Fine-tuning screen is the ideal tool to set the gains and test the response.

To tune the position loop on the NextMove we start by setting two gain terms, KPROP and KVELFF. The value for KVELFF can be calculated from the configuration of the drive.

$$KVELFF = \frac{2048 \times (\text{Number of loop closures per second})}{\text{Max Speed(rps)} \times \text{Encoder Resolution (cpr)}}$$

Number of loop closures per second is set using the LOOPTIME command. This is 1000 μ s (1ms) by default which gives 1000 loop closures per second. (1 / 0.001 = 1000)

The max speed is defined in the drive's Application Max Speed Setting (default 3000rpm). To convert from rpm to rps divide by 60, eg 3000rpm = 50rps

The encoder resolution is also defined in the drive settings as the simulated encoder output resolution. It is the value in counts per rev (4 x pulse count) that is required, for example a 1000 line encoder will give 4000 counts per second due to the effects of quadrature.

Using the default values

$$KVELFF = \frac{2048 \times 1000}{50 \times 4000} = 10.24 \quad (\text{KVELFF} = 0.156 \text{ for SSI with max resolution})$$

If your settings are different, use these values in the calculation to determine the correct value for KVELFF for your system. Clearly if any of these parameters are changed on the drive then a new value for KVELFF needs to be calculated.

The value of KPROP (Proportional Gain) is normally determined experimentally. This means you need a starting point, a value of 0.1 is appropriate for most systems.

To test these values you need to define a suitable test move. Provided your motor is still unloaded it should be safe to make a move, a profile lasting about 1s is ideal. It is also best to choose accelerations and speeds that define a trapezoidal profile shape. In the Fine-tuning screen on the Position tab type in the following values which are suitable if scaled in Revs:

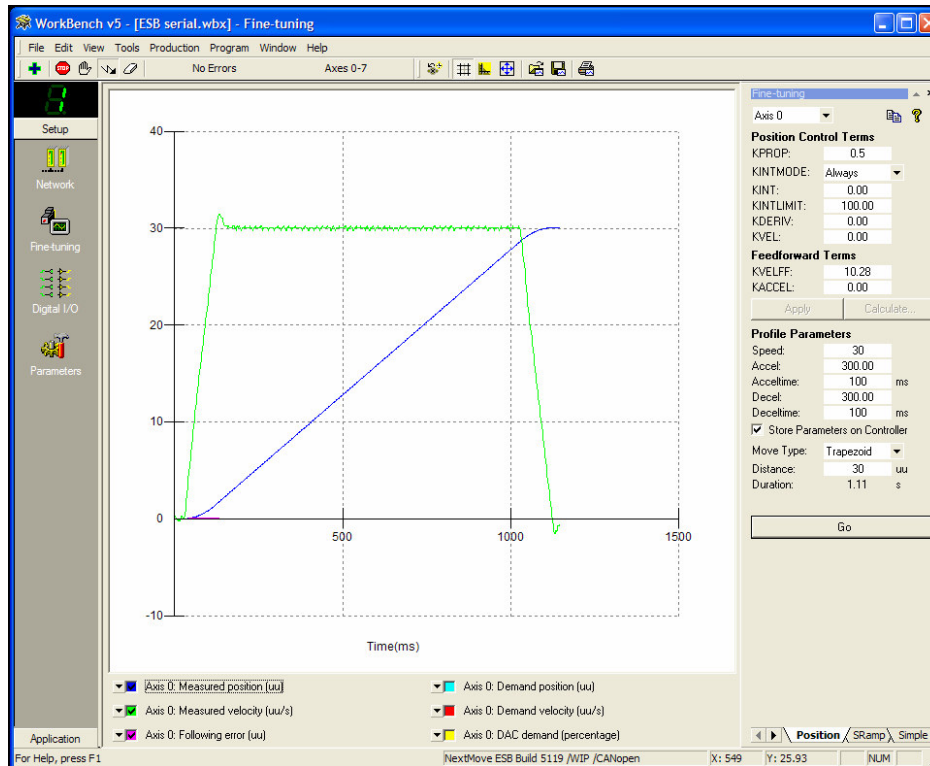
Speed = 30 (rps)
Acceltime = 100 (ms)
Deceltime = 100 (ms)
Distance = 30 (revs)

These values give a move time of 1.1s

Make sure the KPROP and KVELFF values have been typed in correctly and click the GO button.

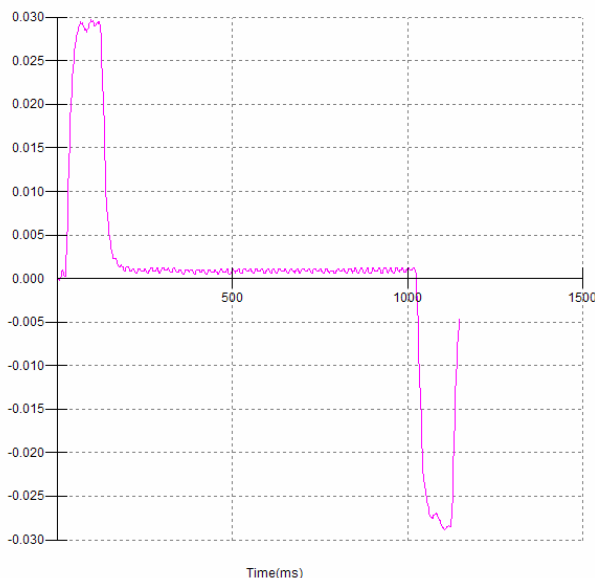
The motor will perform the move and the captured data will be uploaded and displayed on the screen. If the motor vibrates excessively then the starting value for KPROP could be too high; this is more likely with high resolution systems. Try a smaller value of KPROP like 0.01.

Mint^{MT} Application Note



In this diagram the trapezoidal shaped line (in green) is the measured velocity trace and the "S" curve (blue) line is the measured position. It is also possible to turn on and off the Demanded Velocity and the Demanded Position, the objective of tuning is to get the measured line as closely as possible.

To fine-tune the gain terms it is best to look at the difference between the measured position and the demanded position, known as the following error. To see this on your graph make sure all other plots are turned off by unchecking the check boxes.



This is a typical plot of following error for a trapezoidal move. The peaks at the beginning and ends of the profile represent the acceleration and deceleration periods. The flat area in the centre is the constant speed section. Adjusting KVELFF will move the flat line up and down, the ideal is zero. This can be used to fine tune KVELFF. If the calculation has been done correctly only very small changes will be required (0.01 at a time)

Mint^{Multi-Tasking} MT Application Note

Increasing KPROP will reduce the magnitude of the peaks during acceleration and deceleration, however an excessive value is likely to introduce oscillations. To fine-tune KPROP gradually increase its value, repeating the test move each time, until the peaks reduce in size or oscillations in the response start to appear. At this point the value should be reduced a little until no oscillation is observed. Another simple check is to hold the motor shaft to make sure it is stiff and does not vibrate after tuning with the test moves and plots. If a vibration is felt, reducing the value of KPROP is recommended.

Other gain terms can be added to improve the response, but this is beyond the scope of this document. Please refer to the manuals and help files for more information.

When the tuning is complete it is advisable to turn the Following Error Detection back on, without this it is possible to build up very large following errors which may result in the motor running off out of control. Use the command

```
FOLERRORMODE(0) = 1
```

Creating a Program

The NextMove is now configured and ready for programming. The first thing to do to create a program is to include all of the settings made during the configuration. WorkBench v5 makes this very simple. In the *Edit & Debug* screen use the *File > New File* menu option to create a new blank program. Then select *Tools > Upload Configuration Parameters*, to create a Startup block in your program containing all of the settings made during the configuration process.

The following is a very simple test program which can be typed in above the Startup block code of your program.



```
'Test program for NextMoveESB

Auto                                'Runs program on powerup of controller
RESETALL                            'Clears errors and enables drive

HOMESPEED(0) = 10                   'Sets the homing speed to 10 rps
HOMEBACKOFF(0) = 3                   'Sets the backoff speed to 10/3 rps
HOME.0 = _hmNegative_Index           'Move axis to index pulse in a negative
                                     direction then zero the position
                                     counter

Pause IDLE(0)                       'Wait for motion to stop

Loop                                 'Set up a never ending loop
  MOVER(0) = 10                      'Move axis 0 10 revs from current position
  GO(0)                              'Start move
  MOVER(0) = -10                    'Move axis 0 back to its start position
  GO(0)
  Pause IDLE(0)                     'Wait for motion to stop
End loop                             'Terminate Loop
```

Mint^{Multi-Tasking} MT Application Note



This code assumes that the preceding set up process has been completed and that no load is connected to the motor. If this code is to be used after connecting a load then the Scale, Speeds and Distances will probably need to be changed.

Connecting a Load

When every part of the system has been tested and is working correctly it is time to connect the load. This will require some parts of the servo system be re-commissioned. The drive will need re-tuning, the controller will need the position loop be re-tuned, the scale factor will probably change, the IO may need configuration etc.

To re-tune the drive the NextMove must supply an enable signal but the position loop should be disabled. The easiest way to do this is to type

```
TORQUE(0) = 0
```

Switch communications to MicroFlex and select the Fine-tuning screen. With the motor load connected simply click the *Measure* button to determine the new load inertia, followed by the *Calculate* button to create new gain terms. Fine tuning can then be carried out as before, adding an appropriate Accel and Decel Time is normally beneficial when tuning loaded motors as a step response is very difficult to achieve. Be very careful not to move too far or too fast during the test moves. It is always best to start with slow short moves and increase until a reasonable motion profile is attained.

To tune the NextMove after the load has been fitted, switch to the NextMove and repeat the tuning section. The KVELFF should not change its value but the KPROP may need to be modified. Again make sure any test moves do not exceed the limits of travel. Using scaled units may make this easier. Recalculate the scale factor to represent the mechanical system connected to the motor, use units appropriate to the type of movement (mm for linear travel, degrees or revs for rotary travel). Remember that scale factor is calculated as:

SCALEFACTOR = Number Of Counts per User Unit

When the tuning and reconfiguration is completed, remember to upload the changes into the Startup block by selecting *Tools > Upload Configuration Parameters* from the toolbar menu.

At this point it is a good idea to save the program in the NextMove and the parameter file from the MicroFlex. When connected to the NextMove and in the Edit & Debug screen select *File > Save File*, find a suitable folder on the computer and give the program a name "Test Program.MNT" for example. Note - Selecting Save Project will NOT save the Mint program.

Connect to the MicroFlex, select *Tools > Parameter Table > Upload*, find a suitable folder on the computer and give the parameter file a name "Axis 0 Settings.PTX" for example.

Your system should now be ready to run and work can start on commissioning the application program.