



SERVO DRIVE

Flex+Drive

Sales Position Demo

Operating Manual

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Section 1

General Information

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Introduction

The Flex+ demonstration kit is designed to be a useful tool to demonstrate the capabilities and features of the Flex+ product. The control and motor are pre wired with switches and LED's already connected to the control connector. Simply remove the demo unit from the case, plug it in and demonstrate the capabilities of Flex+. Details of the *Flex+Drive* may be found in MN1276.

Flex+ Demonstration Kit includes the following:

- Flex+ control with all cables
- BSM50A-233EA Motor
- Operator demo box
- AC power cord (115VAC)
- RS232 Cable (Null Modem)
- Setup Software
- Flex+Drive Installation & Operating Manual (MN1276)

Flex+ Features

The Flex+ control combines a brushless AC servo plus a “micro-motion controller” in a compact package that is capable of 15 preset point-to-point moves.

Features Include:

- Up to 15 preset moves or positions
- Homing routine
- Incremental or Absolute moves
- User defined speed and accelerations for each move
- 2 to 15 ampere models
- 115VAC and 230VAC (50 or 60Hz)
- Performance match with Baldor BSM motors and get up to 200 lb-in
- Fully Digital input
- Setup software
- “Wizard” operates in Windows environment
- Easy setup using autotuning
- Internal library quickly identifies motor and control parameters
- Fully protected electronic design
- Agency approvals – UL / CE
- Easy to interface with existing controllers
- Optional RS232 / 485 Ports
- Optional Baldor CAN and CAN Open ports
- Optional customer supplied +24VDC logic supply

Section 2 Getting Started

Setting Up the Demo

The *Flex+Drive* has been wired and autotuned. It is connected to a BSM50 motor and is ready to go when plugged into a 115VAC outlet.

1. Remove the demonstrator from the carrying case.
2. Remove the AC power cord from the case and plug it into the AC Power Receptacle shown in Figure 2-1.
3. Be sure the Power ON / OFF Switch is in the OFF position. (Pressed to the left).
4. Refer to Figure 2-2. Place all switches in the UP (Open or Off) position as shown.
5. Plug the other end of the power cord into a wall outlet.
6. Turn the demonstrator ON by placing the Power ON / OFF Switch in the ON position. (Pressed to the right).
7. The "Ready" LED should be green. The "Monitor" will alternately display "d" (disabled) then "C" (CAN bus not connected). The "DROK Relay" and "DROK Opto" LEDs should be green.

Note: The "Monitor" will alternately display "d" (disabled) then "C" (CAN bus not connected). This is normal with no CAN bus connected.

The drive is now disabled but ready for demonstration. Proceed to Section 3.

Note: The motor shaft should rotate freely by hand. Zero torque is present when the drive is disabled.

Figure 2-1 AC Power Connection

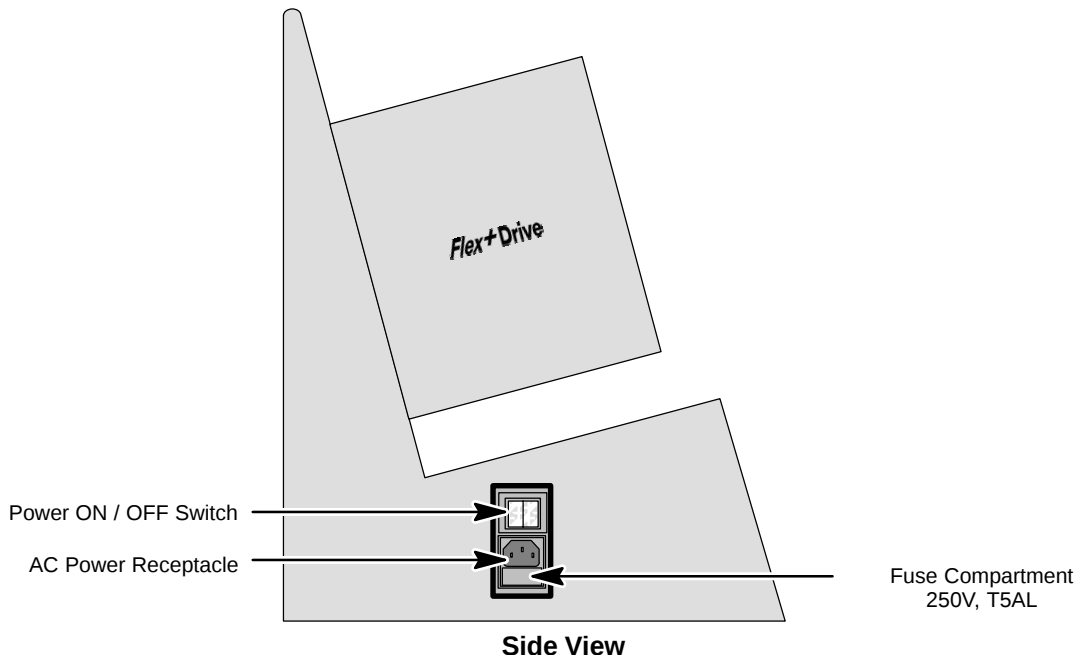
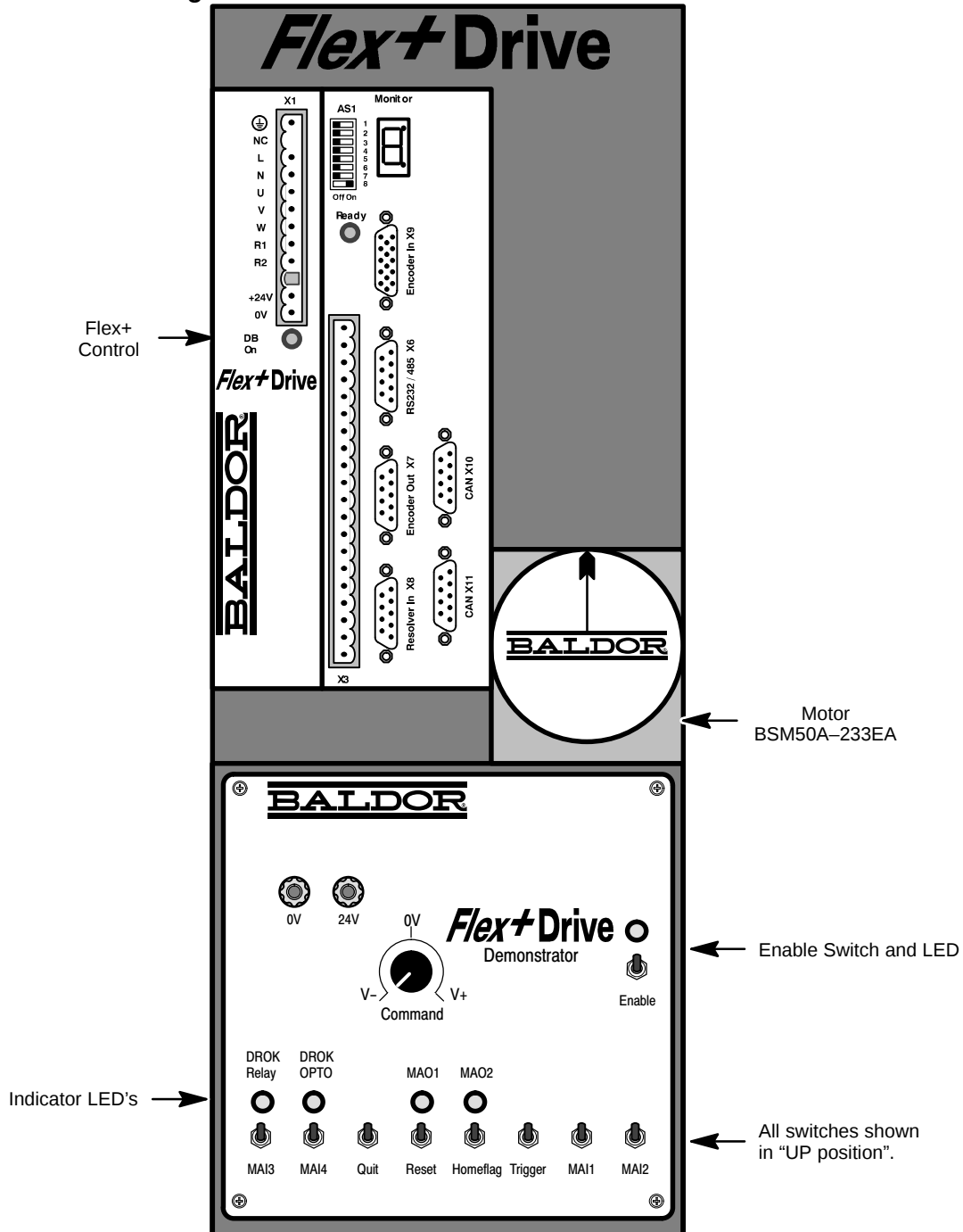


Figure 2-2 Demonstrator Controls and Connections



Section 3 Demonstration

Control Panel Identification

Figure 3-1 identifies the switches and LEDs on the control front panel. Table 3-1 defines the purpose of each.

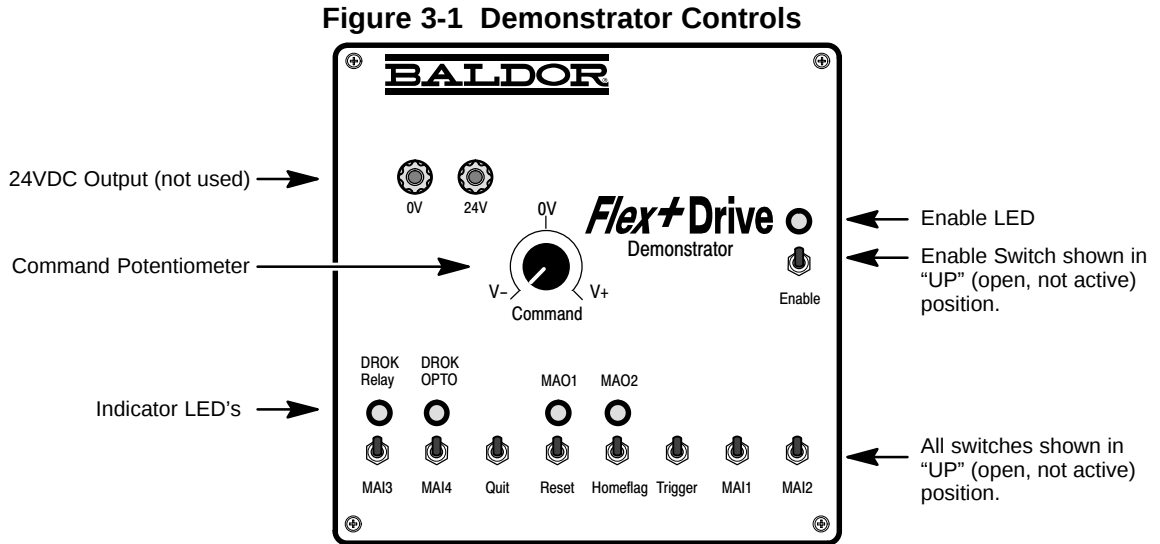


Table 3-1 Front Panel Switch and LED Definitions

Switch			Corresponding LED	
Enable ¹	Up	Drive disabled	Enable LED	Off = Drive disabled
	Down	Drive enabled		Green = Drive enabled
MAI1	Up (logical 0)	See Table 3-2	MAO1	Off MAI1 = 0
	Down (logical 1)			Yellow MAI1 = 1
MAI2	Up (logical 0)		MAO2	Off MAI2 = 0
	Down (logical 1)			Yellow MAI2 = 1
MAI3 – 4	Up (logical 0)			
	Down (logical 1)			
Quit ² (edge triggered)	Up → Down Transition	Stop position mode		
	Up	Position mode active		
Reset ³ (edge triggered)	Up → Down Transition	Reset fault condition		
	Up	Normal operation		
Homeflag (edge triggered)	Up → Down	Opening (falling) edge		
	Down → Up	Closing (rising) edge		
Trigger (edge triggered)	Up → Down	Opening (trailing) edge		
	Down → Up	Closing (rising) edge		
			DROK Relay	OFF Relay fault =False Green Relay fault =True
			DROK Opto	OFF Opto Out fault =False Green Opto Out fault =True

¹ When Enable = Down, Monitor shows "P" for position mode enabled.

² When Quit = Down, Monitor shows "H" for HOLD mode enabled.

³ When Reset = Down, Monitor shows "d" for position mode disabled.

Factory Installed Settings Absolute moves

15 predefined absolute moves have been programmed at the factory. These moves are defined in Table 3-2.

Table 3-2 Machine Inputs and Position Move Definitions

Buffer (Move Number)	Machine Inputs				Position	Speed (RPM)	Acceleration (RPM / ms)
	MAI4	MAI3	MAI1	MAI2			
0 (Home)	OFF	OFF	OFF	OFF	0	100	40
1	OFF	OFF	ON	OFF	100000	2000	300
2	OFF	OFF	OFF	ON	200000	2000	300
3	OFF	OFF	ON	ON	300000	2000	300
4	OFF	ON	OFF	OFF	400000	2000	300
5	OFF	ON	ON	OFF	500000	2000	300
6	OFF	ON	OFF	ON	600000	2000	300
7	OFF	ON	ON	ON	700000	2000	300
8	ON	OFF	OFF	OFF	800000	2000	300
9	ON	OFF	ON	OFF	900000	2000	300
10	ON	OFF	OFF	ON	1000000	2000	300
11	ON	OFF	ON	ON	1100000	2000	300
12	ON	ON	OFF	OFF	1200000	2000	300
13	ON	ON	ON	OFF	1300000	2000	300
14	ON	ON	OFF	ON	1400000	2000	300
15	ON	ON	ON	ON	1500000	2000	300

Note: The machine Inputs of Table 3-2 are “OFF” when the switch is in the “UP” position. Therefore, when MAI1 – 4 are in the “UP” or OFF position, move number 0 (Home) is selected.

Move to Buffer 1 Position (Absolute move to position 100000).

Note: To stop a move before it has completed, disable the drive (Enable switch = UP) or Reset (Reset switch = Down and Up) or (Quit switch = Down and Up).

1. Place all switches in the UP position.
2. Place the Enable switch in the “DOWN” position (Enable LED = ON).
3. Place switch MAI1 in the DOWN position. (MAO1 LED = ON).
4. Place switch Trigger in the DOWN position. Motor immediately moves to position 100000.
5. Place switch Trigger in the UP position.

This completes an absolute move to buffer 1 position. Use switches MAI1 – 4 to select other move numbers and use the Trigger switch to begin each move.

Note: If the motor is already at buffer 1 position, telling the drive to do another absolute move to the same position will not cause the motor shaft to rotate. Therefore, command a move to a different absolute position before commanding another move to buffer 1 position.

PLC Function

The built in PLC function has been factory set to map the machine input MAI1 to Machine output MAO1 and machine input MAI2 to Machine output MAO2. Therefore, the MAO1 and MAO2 LED's always indicate the state of MAI1 and 2 respectively and demonstrates that the PLC feature is operating correctly.

Homing

To return to the motor “Home” position, three conditions must be met:

1. Machine inputs 1, 2, 3 and 4 must all be in the OFF or “UP” position to select move #0.
2. The Trigger switch must be moved Down then UP. The move starts on the Up → Down transition. The motor will rotate slowly, looking for the “Homeflag” input.
3. The Homeflag switch must be moved to Up → Down then Down → Up.

Demonstrate Homing as follows:

Move to buffer 1 Position (or any position other than home).

1. Place all switches in the UP position.
2. Place the Enable switch in the “DOWN” position (Enable LED = ON).
3. Place switch MAI1 in the DOWN position. (MAO1 LED = ON).
4. Place switch Trigger in the DOWN position. Motor immediately moves to position 100000.

The motor is now at buffer 1 position.

5. Select buffer 0. Machine inputs 1, 2, 3 and 4 must to OFF “UP”.
6. Move the Trigger switch Down then UP. The motor will rotate slowly, looking for the “Homeflag” input.
7. The Homeflag switch must be moved to Up → Down then Down → Up.

Do step 7 slowly.

On the Up → Down transition, the motor will stop, then reverse direction.

On the Down → Up transition, the motor will stop and again reverse rotation until the point of the Down → Up transition signal was received. The motor will then stop. The motor is now homed and at buffer 0 position.

Note: The home sequence can be stopped before completion by disabling the drive (Enable switch = UP) or Reset (Reset switch = Down and Up) or (Quit switch = Down and Up).

Note: The Flex+Drive parameters “Home type” is set to “Capture” and “Capture Type” is set to “Falling Edge”. This is why Step 7 home position is found on the Down → Up transition of the Homeflag switch.

Note: If the motor is already at the Home position, it cannot be homed again. It is necessary to move away from the home position before starting the home sequence. (Enable switch = Up, rotate the shaft by hand then Enable switch = Down).

Motion Buffer

Although the *Flex+Drive* demonstration kit is programmed and autotuned for 15 moves and a home move, you can easily set up and demonstrate the motion position buffers. You will need a PC with the Flex+ software installed. You also need an RS232 null modem cable connected between the Flex+Drive and the serial port of the PC.

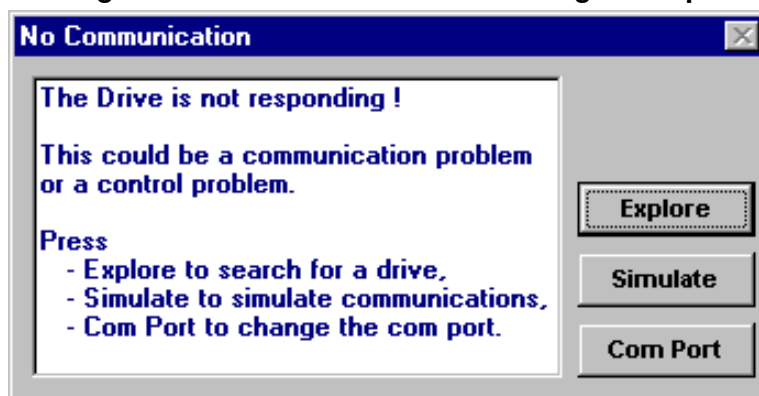
Note: If you download a move, you will overwrite the existing move demonstration program stored in Flex+ memory.

Edit Buffer Procedure:

1. Place all switches in the UP position (drive disabled).
2. Connect the RS232 null modem cable to a PC com port and the *Flex+Drive* (X6).
3. Load the Flex+ software on the PC.
4. Turn the demonstrator ON (Section 2).
5. Start the Flex+ software.
6. You may see a screen like Figure 3-2. If so, select Com Port. Then set the communications to COM1, COM2 or COM3.

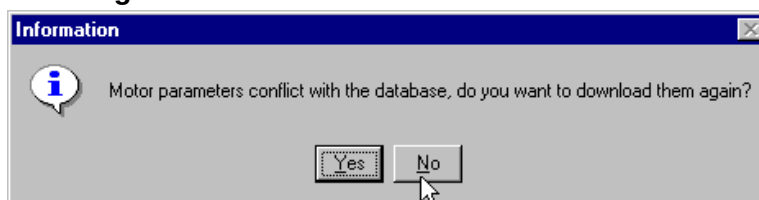
Note: Be sure the COM port on your PC is correctly set. 9600baud, 8bits, 1stop, and no parity.

Figure 3-2 No Communication During Startup



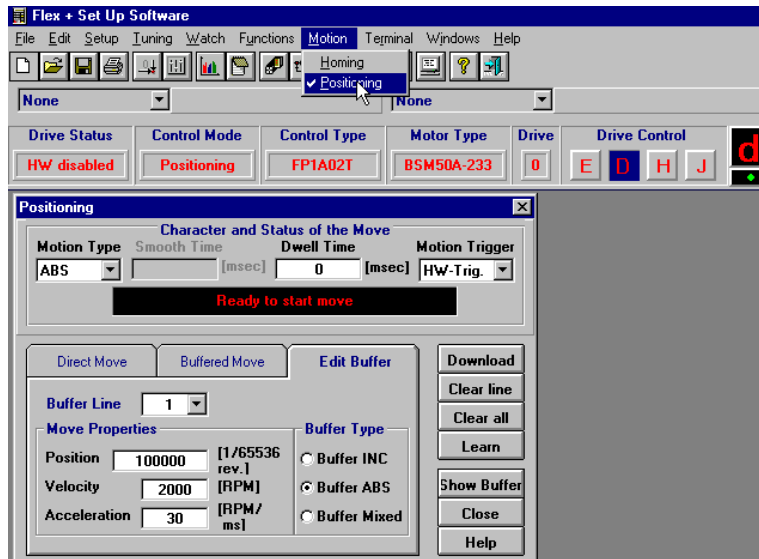
7. You may see a screen like Figure 3-3. If so, click No.

Figure 3-3 Motor Parameters Conflict Error



8. From the Main Menu, select “Motion→Positioning”.
 9. Then select the “Edit Buffer” tab as shown in Figure 3-4.
- Note: Notice that buffer 1 (Buffer Line 1) contains the settings for the present demonstration of absolute moves.

Figure 3-4 Edit Buffer



10. Select Buffer Line 2 and change the Buffer Type to “Buffer INC”. This will allow you to demonstrate an absolute move to Buffer 1 position followed by an incremental move to Buffer 2 position. The final position after both moves will be (Buffer 1 + Buffer 2 = 100,000+200,000= position 300,000).
 11. Click “Download”.
 12. Place the Enable switch in the “DOWN” position (Enable LED = ON).
- Note: If the motor is already at buffer 1 position, telling the drive to do another absolute move to the same position will not cause the motor shaft to rotate. Therefore, command a move to a different absolute position before commanding another move to buffer 1 position.
13. Place switch MAI1 in the DOWN position. (MAO1 LED = ON).
 14. Place switch Trigger in the DOWN position. The motor immediately moves to position 100000.
The motor is now at the position specified by buffer 1.
 15. Place switch MAI1 in the UP position. (MAO1 and MAO2 LED's = OFF).
 16. Place switch MAI2 in the DOWN position. (MAO2 LED = ON).
 17. Move the Trigger switch Down then UP. The motor immediately moves to position 300000 (increments an addition 200,000 from the position of the last move, buffer 1).

Autotuning

The Flex+Drive demonstration kit is already autotuned and ready for use. However, you may wish to demonstrate how easy it is to autotune. You will need a PC with the Flex+ software installed. You also need an RS232 cable connected between the Flex+Drive and the serial port of the PC.

Note: If you download a program, you will overwrite the existing move demonstration program stored in Flex+ memory.

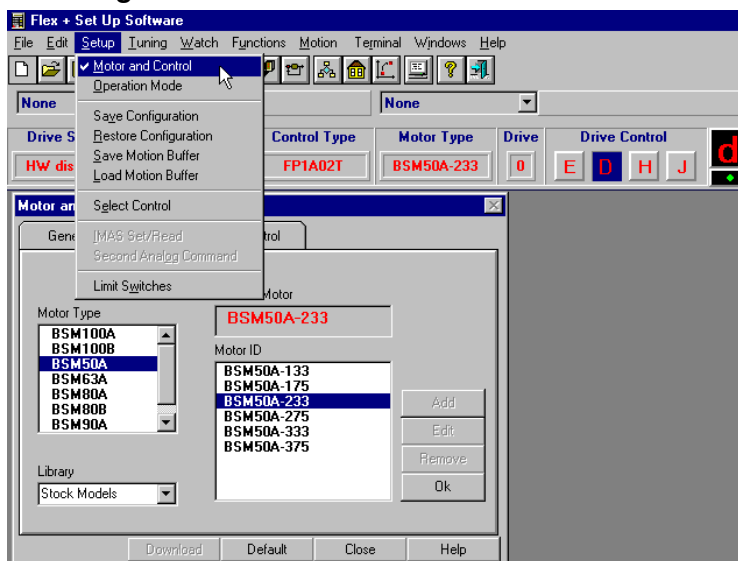
Autotune Procedure:

1. Place all switches in the UP position (drive disabled).
2. Connect the RS232 cable to a PC com port and the *Flex+*Drive (X6).
3. Load the Flex+ software on the PC.
4. Turn the demonstrator ON (Section 2).
5. Start the Flex+ software.
6. From the Main Menu, select "Setup→Motor and Control". (Figure 3-5).
7. Demonstrate that the motor may be selected from a library of motors. (The control is automatically selected and you cannot access the control menu to change the control). Selecting a different motor changes the motor parameters on the "General" tab.

Note: Do not change the Motor Type or Motor ID. If you have changed it for the demonstration, select the proper settings before you continue.

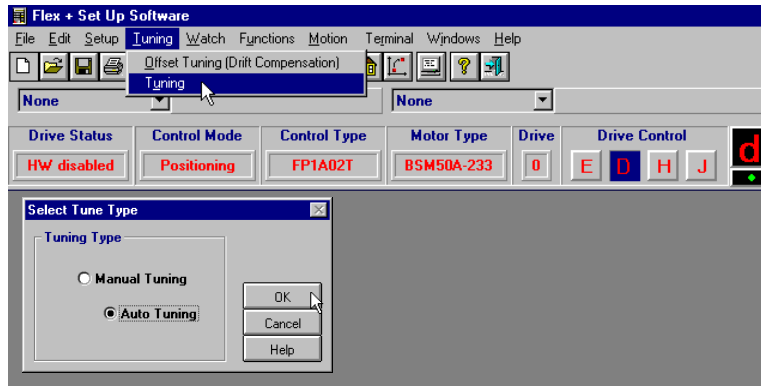
8. Click "Close" (do not download any changes).

Figure 3-5 Motor and Control Parameters



9. Enable the drive (place the enable switch in the DOWN position).
10. From the Main Menu, select “Tuning→Tuning”. (Figure 3-6).
11. Select “AutoTune” then click OK.

Figure 3-6 Autotune Menu

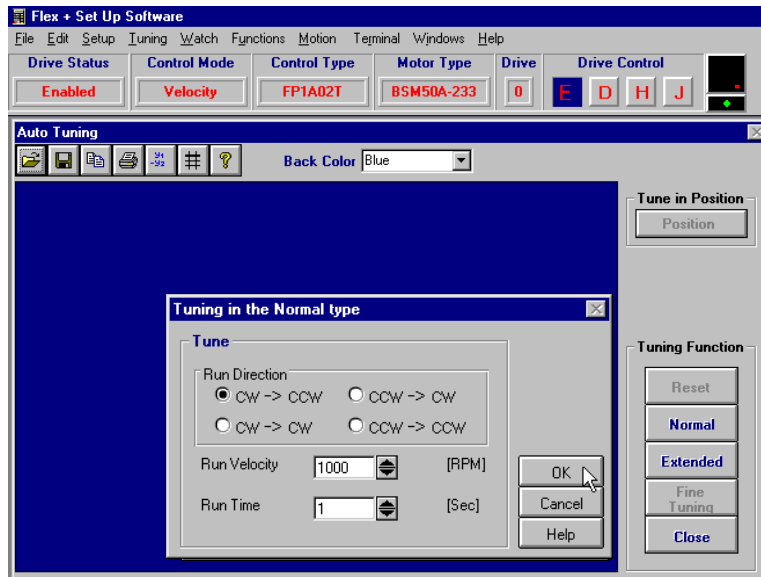


12. Enable the drive.

Note: With the software operating, there is a hardware enable (the Enable switch on the front panel) and a software enable (the enable switch and on the screen, “Drive Control”). If either is disabled, the drive is disabled.

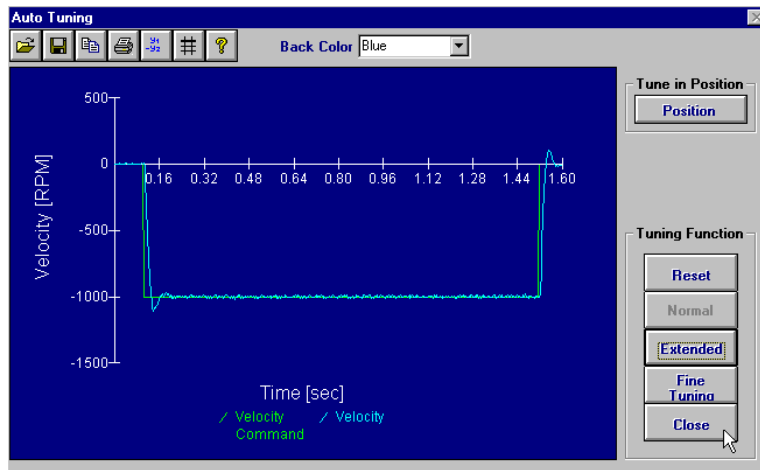
13. Click on “Normal” tuning function. (Figure 3-7).
14. When the CW and CCW widow appears, set the Run Velocity to 1000 and then click OK.

Figure 3-7 Normal tune Menu



15. When the autotune is finished, the graph will be displayed. (Figure 3-8).

Figure 3-8 Autotune Menu

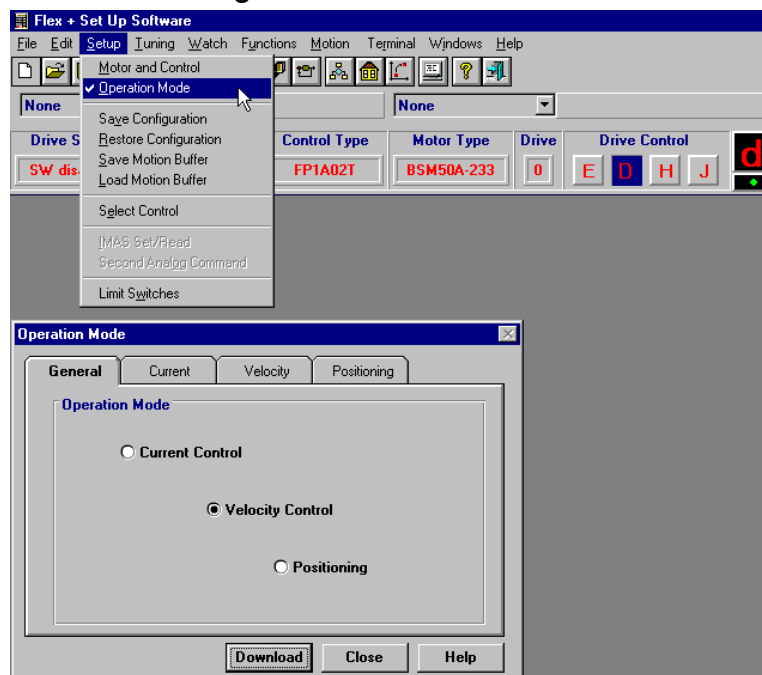


Velocity Mode Operation

You may demonstrate the velocity mode operation of the *Flex+Drive*. First change the mode to velocity then use the Command Potentiometer on the front panel.

1. Disable the control.
2. Set the Command Potentiometer fully CCW (counter-clockwise).
3. From the Main Menu, select "Setup→Operating Mode". (Figure 3-9).
4. Set the operating mode to Velocity then click Download.
5. Enable the drive.
6. Slowly rotate the Command Potentiometer CW to start motor rotation. CW rotation of the pot increases speed, CCW rotation decreases speed.
7. When finished, change the operating mode to positioning and download.

Figure 3-9 Autotune Menu



Note: If you run the motor in velocity mode, the absolute position can be anywhere. Therefore, when you change to positioning mode and do an absolute move to buffer 1 (for example), the motor may rotate for a long time until the absolute position specified by buffer 1 is reached. Before the next demo, move to buffer 1 then home before powering down. This way, you will not make your next customer wait so long for the first move to occur.

Appendix A

Demo Parameter Settings

SYS.LEVEL	=2	POS.IPOS	=10
DRV.IPEAK	=50	POS.KP	=25
DRV.INOM	=25	POS.FFV	=100
DRV.IDX	=3051	POS.FFA	=100
DRV.BUSOV	=210	SYS.RFOFS	=0
DRV.BUSV	=160	SYS.ENCRES	=16384
DRV.BUSAPP	=160	POS.FFTYPE	=0
DRV.I2T	=288	PLC.LINE 0	= "ENABLE" "TRUE"
DRV.ID	=201	PLC.LINE 1	= "MAO1" "MAI1"
MTR.NAME	= "BSM50A-233"	PLC.LINE 2	= "MAO2" "MAI2"
MTR.IDX	=1131	PLC.LINE 3	= "MAO3" "FALSE"
MTR.RPLS	=1	PLC.LINE 4	= "MAO4" "FALSE"
MTR.MPLS	=2	PLC.LINE 5	= "RELAY" "FALSE"
MTR.KV	=37	PLC.LINE 6	= "USRERR" "FALSE"
MTR.KT	=380	PLC.LINE 7	= "FRST" "FALSE"
MTR.JM	=13	PLC.LINE 8	= "DISA" "FALSE"
MTR.IND	=890	PLC.LINE 9	= "DISP" "FALSE"
MTR.RES	=407	PLC.LINE 10	= "HOLD" "FALSE"
MTR.IPEAK	=100	PLC.LINE 11	= "JOG" "FALSE"
MTR.INOM	=28	PLC.LINE 12	= "GEAR" "FALSE"
SYS.ENC	=1024	MOT.ACC	=23
SYS.MOD	=3	MOT.BUF	=0 0 0 0
CUR.INOM	=500	MOT.BUFTYPE	=1
CUR.IPEAK	=1000	MOT.DWELL	=0
CUR.TOFR	=4352	MOT.VEL	=1000
CUR.TOSH	=16	MOT.TRIG	=1
CUR.SCAL	=1000	MOT.TYPE	=1
CUR.VOLT	=100	MOT.INCW	=1
CUR.BEMF	=100	MOT.INCCW	=1
VEL.MXRPM	=4324	MOT.SRC	=1
VEL.BW	=80	HOM.ACC	=399
VEL.INRT	=20	HOM.VEL	=100
VEL.ADZON	=0	HOM.TYPE	=2
VEL.ACC	=0	HOM.OFFSET	=0
VEL.GV	=500	HOM.POLR	=1
VEL.GVI	=20	LIM.CW	=-1
VEL.TRKFCT	=0	LIM.CCW	=-1
VEL.LPFMOD	=0	LIM.ON	=0
VEL.LPFA	=500	SYS.ANGDIF	=6370
VEL.LPFB	=500		
VEL.SCAL	=4324		
VEL.VOLT	=100		
VEL.R0SH	=12		
VEL.R1SH	=12		
VEL.H0SH	=12		
VEL.H1SH	=12		
VEL.DSH	=14		
VEL.R0	=0		
VEL.R1	=0		
VEL.H0	=0		
VEL.H1	=0		
VEL.D1	=-1		
VEL.D2	=0		
VEL.D3	=0		
VEL.CTRL	=2		
POS.FEFAT	=32000		
POS.FEWRN	=4000		

[Motion-Buffer]

1	
0 0 0 0	
1 100000 2000 300	
2 200000 2000 300	
3 300000 2000 300	
4 400000 2000 300	
5 500000 2000 300	
6 600000 2000 300	
7 700000 2000 300	
8 800000 2000 300	
9 900000 2000 300	
10 1000000 2000 300	
11 1100000 2000 300	
12 1200000 2000 300	
13 1300000 2000 300	
14 1400000 2000 300	
15 1500000 2000 300	



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