PBA Systems Operation Manual

BEI Voice Coil Actuator with ELMO HARmonica Driver

Version 1.0 (Preliminary)

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1. Hardware Setup

1.1. Power Supply

HAR requires a +24V DC power supply for the control circuit and DC supply (20 to 180 VDC, depending on HAR model) to drive the motor.

1.2. Electrical Connections

Elmo's digital drives (such as Saxophone, MiniSaxophone and Harmonica) are able to run in 3 different control modes.

- 1. Analog mode
 - +/- 10 V analog command
 - Current mode or velocity mode
- 2. Pulse and direction mode
 - Pulse and direction command
 - Position loop closed in driver
- 3. Standalone mode
 - Software control (position loop closed in driver)
 - Program stored in driver
 - Communicate with other devices through RS232, CANOpen and/or digital I/O
 - Distributed control mode

Notes:

This manual is a simplified version for easy setup of BEI's Voice Coil Actuators with Elmo's digital drivers. For more information, users should refer to the following Elmo manuals.

HAR manuals (hardware):

HAR_Cable_Kit.pdf	HAR cable kit manual
HAR_IG_V1.pdf	HAR user guide
HAR_CF.pdf	HAR Command reference manual
HARV1_0_notes.pdf	HAR release notes
HCAN_IG.pdf	HAR CANOpen Implementation guide

HAR manuals (software):

HAR_SW_manual.pdf	HAR software manual
Composer_SF.pdf	ELMO Composer Software Manual



1.3. Analog mode







1.5. Standalone mode

2. Software Setup

Harmonica drivers (HAR) can be setup using Elmo's **Composer** software. User can download Composer from Elmo's website: http://www.elmomc.com/products/composer-description-contents-main.htm.

This manual assumes Composer has been installed properly. Please refer to Composer's user manual for installation procedure. This manual uses Composer Version 2.9.0.1 (2 Oct 2003). Some of the screen images may be different if other versions are used.

2.1 Setup Communication

From "Start" menu, select "Programs", run "Composer". The following screen will appear:



Please ensure that the RS232 cable (un-crossed type) is connected from PC to driver.

Select "Create a New Application" if you do not have any working application file (.dat files).

Select "Open an Existing Application" if you already have a working copy of the application file (.dat files).

Select "Open Communication Directly" to communicate with driver (bypass setup wizard).

Application1	
- Last Successful Communication Properties	
Disconnected : RS_232; COM3; 19200	[bit/sec]; Parity None
Select Communication Type and	Select Communication Type
connection will automatically be processed according the paramerers above when the <next> button is clicked.</next>	@ RS 232
	C CAN
In order to set different communication parameters use the <properties> button.</properties>	C RS 485

Select RS232 if you are using RS232. (CAN for CANOPEN). Click on "Properties" (see below) to change the Com Port (or CAN manager) setting.

Port Setting		
Com Port	COM 3 :	*
Bit Per Second	19200	<u> </u>
Parity	None	<u> </u>
Data bits	8	¥
Stop bits	1	×
Flow Control	None	

Select Com port to use. (Com 1,2 etc). If communication is successful, the following screen (with driver version number) will be shown. If communication is not successful, try another Com port or check your connections (Com 1 or Com 2). Make sure that the 24V is turned ON and Com cable is connected. Note that com cable used is un-crossed type.

2.2 Setup Driver Parameters

System Data Base				2
Please select the Mot not find a matching pa the motor's parameter	irt number, us			
ELMO Driver version				
	Harmonica 2.02.0	2.00 23Sep2003		
Motor Data Base				
Motor Manufacturer Name		Motor P/N		
PBA Systems	-	VCA-LA15-16-0)20A	
Remove manufact	urer	VCA-LA15-16-)2QA	
Remove motor				
New				
Motor Type	Continuous Stall Current [A]_	Maximum Me Speed [RF		
Rotating Brush 💌	1.9	6000		Edit
Linear Brushless				
Rotating Brush Rotating Brushless	< Back	Next >	Cancel	Help

Select **Rotating Brush** for "Motor Type". Note that Composer does not support Voice Coil Actuator directly. However, it is possible to setup a Voice Coil Actuator as rotating brush motor because they are very similar in terms of electrical characteristics.

Click on "Edit", change the "Continuous Stall Current (A)" according to the motor specification. Some common BEI's Voice Coil Actuators current specifications are list below. These values are mostly round-downed to a convenient figure and serves as a guideline only. For exact specifications, please refer to BEI's data sheets.

Voice Coil Actuator Model	Continuous Current	Peak Current
LA13-12-000A	0.6	1.5
LA15-16-020A	1.9	5.8
LA15-16-024A	2.2	7.0
LA24-20-000A	4.0	10.0

For "Maximum Mechanical Speed (RPM)", you may enter 6000. This is equivalent to 100 revolution per second. In the next dialog box, you will need to enter encoder's resolution in pulse per revolution. Together, these parameters allow the driver to compute the speed limit of this application.

LMO Driver version —			
	Harmonica 2.02.0	2.00 23Sep2003	
Motor Data Base Motor Manufacturer Narr	18	Motor P/N	
PBA Systems	•	VCA-LA24-20-000A	
Remove man	ufacturer	VCA-LA15-16-020A VCA-LA24-20-000A	
Remove	motor		
New			
Motor Type	Continuous Stall Current [A]	Maximum Mechanical A	.dd
Rotating Brush 🔹 💌	4		ncel

User can choose to assign these setting to a unique Motor Part Number under a Motor Manufacturer Name. This is highly recommended so that you do not need to refer to motor specifications in future when you are going to setup the same motor again.

 Current Main Commutation Feedbac	k
Encoder	•
Encoder Resolution	
Pulses per Revolution	2000
Counts per Revolution	8000

Select **Encoder** as Current Main Commutation Feedback. Enter Encoder Resolution as 2000 Pulse per Revolution.

The software will compute the resolution in counts per revolution (x 4, for quadrature encoder). This result in a maximum speed limit = (6000RPM/60second) * (8000 counts) per revolution) = 800000 counts per second. You may want to adjust the 2 parameters to suit your application.

Please review the	Driver Parameters		
following system	Application Continuous Current	4	[A]
default parameters and change them if	Driver Continuous Current	5.00	[A]
necessary.	Application Peak Current	10	[A]
	Driver Peak Current	10.00	[A]
These parameters define the system			
behavior when reaching limits.	- Application Mechanical Limits		
Wrong parameter(s)	Speed	6000	
	opood	100000000	
	Stop Deceleration (SD)	100000000	[cnt/sec^2]
	Stop Deceleration (SD) Low Reference for Position	1000000000	
			000 [cnt]
will affect the safety of the next step(s)	Low Reference for Position	-10000000	000 [cnt]

Enter Application Continuous Current, Peak Current and Speed according to the application's need. The application continuous current must be less than continuous stall current entered in the previous dialog box. You may leave the other fields as default.

Signal	Function behaviors	 In the second s Second second sec second second sec
	runction benaviors	Logic level
Input 1	Ignore	Low
Input 2	Ignore	Low
Input 3	Ignore	Low
Input 4	Ignore	Low
Input 5	Ignore	Low
Input 6	Inhibit (Freewheel)	Low 💌
⊢ Select Functi	Inhibit (Freewheel) Hard Stop General Purpose Forward only (RLS) Beverse only (FLS)	
Signal	Begin	Logic level
Output 1	AUX Home	Low
Output 2	Soft && Hard Stop	Low
	Input 2 Input 3 Input 4 Input 5 Input 6 Select Functi Signal Output 1	Input 2 Ignore Input 3 Ignore Input 4 Ignore Input 5 Ignore Input 6 Inhibit (Freewheel) Inhibit (Freewheel) Hard Stop General Purpose Forward only (RLS) Reverse only (FLS) Begin Soft Stop AUX Home

If you have connected inhibit and/or limit sensors input, assign them accordingly (including their logic level). Otherwise, choose "**ignore**" for all the input.

Some common function behavior descriptions:

- 1. Inhibit (Freewheel) VCA is free to move (servo off) when this input is Active.
- 2. Forward only (RLS) This input is connected to Reverse Limit Sensor.
- 3. Reverse only (FLS) This input is connected to Forward Limit Sensor.
- 4. Hard Stop VCA will stop with maximum deceleration allowed.

2.3 Tuning

	Step 1
There are steps that are mandatory for the achievement of a fully adjusted and tuned servo drive.	✓ Tuning Current Loop
	Step 2
	J Establishing Commutation
	Step 3
If this is not the first	J Tuning Velocity Loop
run of the wizard, you may de-select any of the steps to	Step 4
	✓ Tuning Position Loop
meet your specific need.	Step5
neeu.	🗙 Skip Tuning Dual Loop

- For analog current control mode, only Step 1 and Step 2 are required.
- For analog velocity control mode, Step 1, Step 2 and Step 3 are required.
- For pulse and direction mode, standalone mode and distributed control mode, Step 1, Step 2, Step 3 and Step 4 are required.

and the second				
Upon clicking the <run> button the serva drive energizes the motor's winding with a high frequency current waveform.</run>	- Tuning) Run		
t is not expected that the motor shaft will move, however, precaution is required for the unlikely event of an undesired movement.				

Step 1: Tuning Current Loop

Click "Run" to tune current loop automatically.

Note:

- If Inhibit behavior is set, ensure that it is NOT at Active state. If unsure, set all input to "ignore" and try again.
- It is possible to tune current loop manually. Press "m" at the above dialog box to access manual tuning dialog box.
- It is not recommended to tune current loop manually unless the auto-tuning result is very bad or cannot be use at all. This is possible for some motors where the inductances are very small. In this case, it will be useful to reduce current loop gains manually.

1 Mess	age 🔀
(i)	Process : Tuning of Current Loop
4	Status : Performed successfully !
	Click Yes for the Next step .
	Click No to Repeat this step .
	Yes No

You should see the above message when tuning is successful.

	Please Enter Test Paramete	rs
C-O	Displacement [Cnt]	60
No T	Current Command [A]	1.53
	Test Duration [mSec]	500
	Tolerance [%]	200
Jer u	2 Ru	n

Step 2: Tuning DC Brush Motor Feedback

Before taking the default values and click "Run", ensure that there are enough physical travel distance as required (specified in Displacement (Cnt) field).

Note:

- This process may fail if the Inhibit, Forward Limit Sensor or Reverse Limit Sensor is Active.
- If unsure, set all input to "ignore" and try again.

Mess	age 🔀
	Process : Establishing Commutation
4	Status : Performed successfully !
	Click Yes for the next step .
	Click No to repeat this step .
Г	Yes No

The above message box will appear once this step is successfully completed.

KP KI Advanced F 100 1000 0FF 9 3: Set Test Parameters	tep 1 : Select the Tuning tep 2 : Adjust Filter Param	A second s	ng		-
100 1000 Orr 100 1000 O Desig Displacement [cnt] + Displacement [cnt] Velocity Velocity 0 1000 1000 cnt/sec Smooth Factor Acceleration [count /sec^2] Decele Profiler Mode 5 10000 10000 p 4 : Set Record Parameters Max. Record Time Slope 80.0 μsec/point 0.216 sec ✓ ✓				Advanced Filter	-
Displacement [cnt] + Displacement [cnt] Velocity Velocity Cnt/sec 0 1000 1000 cnt/sec^2] Decele Profiler Mode 5 10000 10000 p 4 : Set Record Parameters Record Resolution Max. Record Time Slope 80.0 µsec/point ▼ 0.216 sec ▼		1000		1. alt.	1
Record Resolution Max. Record Time Slope 80.0 μsec/point ▼ 0.216 sec ▼	0	1000 Smooth Factor 5	1000 Acceleration [count	cnt/sec	-
		aters		Slope	
Run Tes	p 4 : Set Record Param	Max. Record	Time		
	ep 4 : Set Record Param		Time		_
	4 : Set Record Param Record Resolution		Time		

Step 3: Tuning Velocity Loop

For Voice Coil Actuator, you should use "Manual Tuning" or "Advanced Manual Tuning". Auto-tuning requires a long travel stroke which usually exceed the physical available stroke for a Voice Coil Actuator.

Set "- Displacement" and "+ Displacement" at least 20% smaller than the available stroke to allow overshoot during tuning. During tuning, the actuator will cycle in positive and negative direction repeatedly. Hitting the hard stopper will yield inaccurate result. Velocity and Acceleration/Deceleration settings should also start from small values.

Start with small KP (e.g. 1) and KI (e.g. 10). If the actuator doesn't move at all (the data acquisition message window will wait forever for the triggering event), cancel the data acquisition process and increase KP and KI.

Typically, KP is around 100 and KI is around 1000. However, these parameters vary with different loads and motion profiles. During the tuning process, the Voice Coil Actuator may oscillate vigorously. Make sure the actuator is mounted firmly on a rigid frame. You may cancel the tuning (click "Cancel") before the motion stops and try again with smaller KP and/or KI.

Click "**Run Test**" to start the test motion and data acquisition. A graphical display (scope) will appear once the data acquisition is completed. User can zoom in/out, drag the primary cursor to check the instantaneous data (showed in the status bar).

Re-iterate KP and KI until the result is acceptable. Click "Next" only when you have found the optimal KP and KI values.



After each iteration, the above scope will appear. Typically, velocity loop doesn't require very good following performance and usually an overshoot is allowed to ensure fast response in the position loop.

If the performance is no good with manual tuning, user can choose to select "Advanced Manual Tuning". Elmo's digital drives have a gain scheduling algorithm built in where the driver can switch KP and KI automatically according to the travel velocity.

In Advanced Manual Tuning, there are a maximum of 64 sets of KP and KI. User can choose to manual tune all 64 sets of gains or tune a few sets of KP and KI, and let the software interpolate the rest. Refer to ELMO's manual (Composer user guide) for more information.

KP Outer Posi	100.0000	KI 10	000.000	- Advanced F	ilter
KP	100.0			OFF OFF Design	ner
1.12.2	1000				
tep 3 : Set	Test Parameters	Step [cnt]	Speed	Sper	ed Unit
	Γ	1000	1500.000	cnt/sec	
		Smooth Factor	Acceleration [c	ount /sec^2] Decel	eration
		5	50000	5000	0
	Record Paramete				
Hecord	Resolution	10	cord Time		
360.0 µsed		0.432 sec			

Step 4: Tuning Position Loop

Similar to velocity loop, position loop for Voice Coil Actuator should be tuned manually (Manual Tuning or Advanced Manual Tuning).

Set "Step" (travel displacement) according to the required travel distance. Speed and Acceleration/Deceleration setting should eventually set to the required values to test the actual operational performance. However, it is advisable to start from slow speed and low acceleration to avoid excessive overshooting and oscillation when KPs and KI are far from optimized.

Click "Run Test" to start motion and data acquisition.

Iteration of Position Loop KP is required to optimize the performance. User are allowed to modify the Velocity Loop KP and KI if necessary.

Again, if the performance is not ideal, user can choose to tune in "Advanced Manual Tuning" mode to modify 64 sets of control gains at different velocity. Refer to ELMO's Composer User Guide for more information on Advanced Manual Tuning.

Click "Next" after an optimized set of control gains are obtained.



After every iteration, the above scope will appear. User can zoom in/out the graphs and drag the primary cursor to different position to check the instantaneous data (showed in the status bar). An example of zoomed in graph is shown below. Note that dX value showed in the status bar is the time difference between the 2 cursors.



The following paramete changed by Wizard.	rs were	Click the <finish> button to write</finish>
Low Position Reference Limit=10 Application Peak Current [A]=5.50 Application Continuous Current [A Command Source = Software KP for Current Loop =4.785000 KI for Current Loop =19346 Profiler Mode = ON Smooth Factor=5 Acceleration=5000000 Deceleration=5000000 Jogging Velocity=5000 KP - Velocity Loop without Gain So KI - Velocity Loop without Gain So KP - Position Loop without Gain So Motion mode = Position Mode	0 x]=1.700 chedule=100.0000 chedule=1000.000	these parameters to the FLASH. Click the <back> button to repeat the previous steps. Click the <cancel> button to exit WITHOUT saving</cancel></back>
ad .		Application Editor

Finally, a summary of all parameters will appear. Click "Finish" to continue.

The following parameters were	Click the <fir< th=""></fir<>
Save As	
Save in: 🔂 Demo	- 🔁 💣 🎟
1424-20-000A.dat	
File name: [L424-20-0004	

User will be prompted to save the application data.

🥐 Elmo Compose			10 X
Pile Edit View Communication Foots Window Help	6 🛄 🛃 = 59W 💦 🔤 😵 1.A24-204	100A_COM1 🔄 😁 😭	
and because of the second se			
Te Stratt Ternited Enter Consard:	Profile Pices Files (Protections Lines.) Digital Files.) P Enable Profile Smooth lactor: 5 ediec. Acceleration Deceleration (count/ueo."2) Acceleration 2000000 Deceleration 2000000 Test Motion Speed: 5100 Files.	Laton Analog treat hou 4 +	
For Help, press F1			NUM

The "Smart Terminal" will appear.

A 🕼 Position Mode 💽 🟃 🚥	🕅 🛄 🛃 📼 SYN 🍂 🕮 🧣 🕺 🛛 LA24-20-000	A_COM1 🔄 📶
mart_Terminal		
iter Command : Send	Profile Noise Filter Protections Limits Digital Filters Cust Operating Mode	1
	Software Image: Control of the second s	
	Input 2 Source [V] Result	Offset for Input 1

To save all parameters to the non-volatile memory in the driver, type "**SV**" in the "Enter Command" field and click "Send". You should see an echo of "SV" followed by a semicolon, ";", if the command is executed correctly.

Before saving to non-volatile memory, any loss of power (24V auxiliary power supply) will result in **loss of all settings and tuning data**. User will have to re-do the whole process again. Hence, it is important that this step is not missed and should be done as soon as possible.

3. Diagnostic and Troubleshooting

There are very good diagnostic and troubleshooting tools available in Composer. This section briefly introduces some commonly used features in Motion Monitor.

音 🔏 🕼 Velocity Mode	Smart Terminal Motion Monitor	😰 🚎 SYN 🖹 🏧 🦻 🐑 🛛 LA24-20-000A_COM1 💽 🕋 🕇
Smart_Terminal	Elmo Studio	
Enter Command : Send	Table Editor Sync Management	Noise Filter Protections Limits Digital Filters Custom Analog Input Inpu
	Wizard Advanced Manual Tuning	nable Profile Smooth factor : 5 mSec.
	Firmware Download	
	Scope	leration : 50000000 Deceleration : 50000000 ? Help
		Speed : 75.000 RPM 💌 🖌 Go
		Direction : 📿
	-	? <u>H</u> elp

Select "Tools" from the menu bar, click "Motion Monitor".

10000	Record		Ind	lications		Motor
splay Colo	r Signals	Trigger	Display 1 1190	Display 2	0	OFF
	Position			1		0
	Position Command	Source Position	Position [cnt]	Velocity	[RPM]	0
	Active Current [A]	Delay 0%	Active Current [Arms] Auxiliary Position [cnt]	5	6 Digital Ou	tput 2
	Current Command [A]		Position [cnt]			0
Resolution	Max. Record Tim	- High 🛛 🔽 🗖	Position Error [cnt] Velocity [RPM]		0 0	0
160 µsec/po			Velocity [cnt / sec] Velocity Error [RPM]		Amplifier Status —	
High Reso	lution Reset Signals	Mapping Start Record	Velocity Error [cnt / sec]		Amplifier OK	J

Motion Monitor Window will appear. On the right hand side of the window, there are 2 display fields, "Display 1" and "Display 2". They are updated continuously. User can pull down the list to select a data source to display here.

Below the 2 displays, there are digital I/Os indication and Amplifier status.

Recorder				Indications						- Motor-
isplay Color	Signals	Trigger	Display	1	1190	Di	splay 2	1)	OFF
	Position	Mode Single	·	15						0
	Position Command	Source Position	- Position		[cnt]		elocity	(RP		0
	Active Current [A]	Delay 0%		Input-	3	4	5	6	– Digital Ou	atput
	Current Command [A] 🔻			â	25			1970	à	á
Resolution	Auxiliary Position	High 0		0	0	0	0	0	0	0
360 µsec/point	Auxiliary Velocity Current - Phase A		Last Fa	ailure —				Amplif	ier Status -	
High Resolu	Current - Phase B	Mapping Start Record O None			Amplifier OK I		(T			
	Current Command [A]							1		

On the left hand side, there is a "Recorder". It behaves like an oscilloscope. User can choose to record various data in one or more graphs. If the required data source is not in the pull down list, click "Mapping" button to re-map the data sources.

After selecting the data sources to capture, there is a choice of data resolution. The better the resolution, the shorter the record time.

Next, select the trigger mode. Typically, "Single" is selected (record on the first trigger event). Delay can be set so that data before the trigger event are recorded. For example, if "Delay" is set to 50%, then half the recorded data are before the trigger event.

The trigger source is usually one of the data source to record (but not necessary). User must define rising edge, falling edge or both in the "Slope" setting. For example, if Position is chosen as the trigger source and under "Level (cnt)", High is set to 100, with the rising edge button selected, then the recorder will start recording when actual position crosses 100 counts in the positive direction.

With these functions, user can monitor encoder signal, analog input commands, motion profile (actual and commanded), etc. Motion time can also be measured from the graphs.

For more detailed explanation of these functions, refer to Elmo's Composer User Guide.

4. Programming

🖆 🔏 🕼 🛛 Velocity I	Smart Terminal Motion Monitor	E 5YN 🔊 🔤 🤋 👷 LA24-20-000A_COM1 🖃 🖀
월 Smart_Terminal	Elmo Studio	
- Enter Command : Send	Table Editor Sync Management	Profile Noise Filter Protections Limits Digital Filters Custom Analog Input Inpu
	Wizard Advanced Manual Tuning	Enable Profile Smooth factor : 5 mSec. Apply Acceleration - Deceleration (count/sec.^2)
	Firmware Download	
	Scope	Acceleration : DOUDDOUD Deceleration : DOUDDOUD ? Help
		Speed : 75.000 RPM 💌 🗹 Go
		Direction : 💫
	-	? <u>H</u> elp

To enter Elmo's programming environment, select "Tools" from menu bar, click "Elmo Studio".

Elmo Studio - [10 TriggeredProgram_VCA.AIS abl <la24-20-000a_c0< th=""><th>OM1>]</th><th>_ 5 X</th></la24-20-000a_c0<>	OM1>]	_ 5 X
🔁 Elle Edit (New Build Icols Window Help		
1221日日本12月1日	A1 %	
曲 @ ! 出品 M6 8 8 円形形 市屋 图 i 目	1	
wait 300;		*
MO-1; HM[1]=0)		
HM[2]=0; ** DX=0 after homing		
HM[3]=1; ** Use home sensor		
HM[4]=0; ** STOP after homing event		
HM[5]=0; ** 867 HM[2] into PM JV=-50;		
HM[1]=1;		
BG;		
until HM[1]==0)		
##LOOP		
PA=S:		
BGJ		
until M8==0; OLD DEST=(IP60x70000)>>16; ** CHECK DIN	eri _ 0	
OLD_DEST-(IFROR/ODDI)/SID; CHECK DIN	A 4 - 2	
while (1)//##LOOP		
while (IB[21]) ** CHECK INHIBLY SIGN	NAL	
ио-0;	A CARLES AND AND A CARLES AND A CARLES AND A CARLES AND A	
OB[1] = ((VX>5) (VX<-5)) OB[2]=0; // Servo Ready Signal	((PE>5) (PE<-5)); //Motion Status	
endi	(odepue)	
		_
MO-1;		
OB[2]=1/ // Servo Ready Signal (out		
OB[1] = ((VX > 5) (VX < -5)) ((PE)	E>5] [] [PE<-5)]; //Motion Statue	
DEST-(IP40x70000)>>16; ** CHECK DIN	N1-3	
if (DEST1=OLD_DEST)		
goto##LOOD		-
Tel		1
S Build (Debug), Findin Files 1), Find in Files 2), Communication		
		1
For Help, press FT	Ln 1, Col 1 DDS NUM	05:07 PN E

The Elmo Studio editor will appear. For details of Elmo's programming languages, refer to Elmo's manual (<u>http://www.elmomc.com/support/manuals/HAR_SF_0903.pdf</u>).

Elmo Stadio - 80 Triggerod Program, VCA ALS also 8 Bit Edit View Duid Isols Window Help	The date opporting to the	
Con Con Service (Contraction Contraction)	- 94 - 29 LA24-20-000A_COML41 X?	.al 21.
and many and		
	20 1	
wait 300; 🖬 🕼 Program Chi+Scrollade MO=1;		3
HN [1] =0; Evecute CONFS		
HK[2]=0; [26bug	<u></u>	
HM[3]=1; ** Use home sensor HM[4]=0; ** STOP after homing		
HM[5]=0; ** SET HM[2] into WM		
JV50;		
HM[1]=1;		
BG;		
until HM[1]0;		
##LOOP		
PA=X;		
BG:		
until M8==0; OLD_DEST=(IP:0x70000)>>16; **	01000 DTU1 2	
0DD_DESI-(1F60K/0000)//10/	CHECK DINI-3	
while(1)//##LCOP		
while (IB[21]) ** CHECK IN	HIBIT SIGNAL	
NO=0;	NAMES OF A DESCRIPTION OF	
OB[2]=0; // Servo Res	<pre>//Motion Status //Motion Status //Motion Status</pre>	
ends	ed eräner (sacher)	
		3
HO=1;		
OB[2]=1; // Bervo Ready S	lignel (output))) ((PE>5) (PE<-5)); //Motion Status	
OB[4] - ((VA23) 11 (VA23	11) [] ((max-2))) (increase areas	
DEST=(IP60x70000)>>16; **	CHECK DIN1-3	
if (DESTI=OLD_DEST)		
goto##LCOP		
		×
Build (Debug), Find in Files 1), Find in Files 2	2 \ CommunicationLog /	2
THE PARA VALUE VIEW AND VALUE		2

An example of Elmo's High Level program is below:

```
#@AUTOEXEC
SP=1000; // speed = 1000 counts/sec
AC=10000; // acceleration = 10000 counts/sec2
DC=AC; // deceleration = aceleration
wait 300; // wait for 300ms
MO=1; // turn on motor (servo on)
while(1) // infinity loop
    PA=5000; // Move to 5000 (absolute position)
    BG; // Begin move
    wait 2;
    until MS==0; // Wait for motion completion
    wait 500; // Dwell for 500 ms
    PA=0; // Move to 0 (absolute position)
    BG; // Begin move
    wait 2;
    until MS==0; // Wait for motion completion
    wait 500; // Dwell for 500 ms
end;
```

After writing the program, user has to build and download the program into the driver. Select "Build" from menu bar and click "Build". It will compile the codes and download to the driver if compilation is successful. This will take a few seconds.



The program can be executed from Elmo Studio, or if there is a #@AUTOEXEC label in the program, it will start automatically from that line when the driver is powered up.