

Section 1:

	How To Load A Preset Program Into DrvX3st	3 –
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Section 2:

7–
<i>,</i>

22

Safety Issue:



Check servo motor first by turning the motor a resolution manually to confirm there is no object obstructing the motion.



Make sure there is no human present nearby the servo motor when tuning is ongoing.



Hit emergency switch immediately when notice there is something going wrong.



Ignoring the above warning will cause serious injuries.

Section 1

How To Load A Preset Program Into DrvX3st

1. Start up DrvX3st by clicking on the icon.



- 2. Check the connection from industrial computer's comm. port to servo motor driver's comm. port. Refer technician if assistance needed.
- 3. The window below will appear. Click on the "Connect" button.

Support Tool -	- [No Connect]			×
COMMUNICATION Port	ON Channel © Single UR1BG	3-060N-%%C-2T*-%	Connect	Simulation mode
Online 1	C Multi		Initiali <u>z</u> e	Mode config
Display 	#Paramgter mon.	1/0 mo <u>n</u> .	Axis Signal mon.	Erro <u>r</u> mon.
Data management #Parameter	Table data	<u>[</u> /0		
#Parameter viewer	Table viewer(\underline{K})	1/0 viewer(<u>J</u>)	Backup	⊻ersion info.

Figure 2: Offline screen

4. Than click on "Backup" button to load a preset program into the driver.

File Help
I II ?
COMMUNICATION
Port Simulation mode
C Offline
Online Multi Mode config
MENU
Operation
<u>Drive</u>
Display
<u>O</u> scilloscope #Param <u>e</u> ter mon. I/O mo <u>n</u> . Axis Signal mon. Error mon.
Data management
#Parameter Table data I/O
Maintenance
#Parameter viewer Table viewer(K) I/D viewer(J) Backup Version info.

Figure 3: Connected screen

5. A popup will appear and click on "Open" than choose the specific file to be restored into the driver.

Ng Backup / Restore	<u>_ ×</u>
	Exit
	Driver
	Download (PC->Driver)
	Upload (Driver->PC)
	- File
	<u></u> pen
	Save <u>a</u> s

Figure 4: Backup screen

6. Example below will restore a program for G3 servo motor. Make sure the file extension is .wha and than click on "Open" to load it.

Open				? ×
Look jn	🔁 Template	▼ ⇐ €	💣 🎟 -	
History Desktop My Computer	G3.wha			
My Network P	File <u>n</u> ame:	G3	•	<u>O</u> pen
	Files of <u>t</u> ype:	Backup file(*.wha)	J	Cancel
		Dpen as read-only		1.

Figure 5: Open screen

7. Detail of the setting will be presented and click on "Download (PC->Driver)" button and the servo motor are ready to be tested.

饕 Backup / Restore	<u>- 0 ×</u>
Drv02 serise	E <u>x</u> it
DrvG3	Driver
[ROM version] ID : R7040CA	<u>D</u> ownload (PC->Driver)
Ver : 1.21 RomSum : 74fc	Upload
[MotorType] UR1BG3-060N-%%C-2T*-%	
Default 	<u>O</u> pen
Time : 10:57	Save <u>a</u> s

Figure 6: Download screen

8. To test, open terminal screen and key in the code "@5:0" than enter to set the controller to serial comm. than key in "@3:1" for homing purpose follow by "@3:2" for single index. Continue doing single index for a few times to see if there is any offset of the turret. If yes, proceed to section 2.

yDrvX3 Support Tool -	[6111]			
<u>F</u> ile <u>H</u> elp				
I I 2				
COMMUNICATIO	ON NC			
Port	Channel			Simulation mode
C Offline	💿 Single UR1BG3	3-060N-%%C-2T*-%	Disconnect	🔘 Motor 🌀 Amp.
C Online 📔 💌	C Multi	V	Initialize	Mode config
MENU				
Operation		1		
<u>D</u> rive	<u>I</u> erminal			
Display		<u> </u>		
<u>O</u> scilloscope	#Param <u>e</u> ter mon.	1/0 mo <u>n</u> .	Axis Signal mon.	Erro <u>r</u> mon.
Data management				
#Para <u>m</u> eter	Table data	<u>I</u> /O		
Maintenance				
# <u>P</u> arameter viewer	Table viewer(<u>K)</u>	I/O viewer(J)	<u>B</u> ackup	<u>V</u> ersion info.

Figure 7: Main screen



Figure 8: Terminal window

Section 2

How To Tune G3 Servo Motor Using DrvX3st

1. Assuming the servo motor is brand new or the loaded program needs more tuning, user must make sure DrvX3st is already in the connected status. Than open "Parameter" as shown.

饕 DrvX3 Support Tool -	[GIII]			×
<u>File H</u> elp				
B B ?				
COMMUNICATIO	DN			
Port	Channel			- Simulation mode
C Offine	Single UR1BG	3-060N-%%C-2T*-%	Disconnect	🕘 Motor 🥥 Amp.
© Online 1	C Multi	7	Initiali <u>z</u> e	Mode config
MENU				
Operation				
Drive	<u>T</u> erminal			
Display				
<u>O</u> scilloscope	#Param <u>e</u> ter mon.	1/0 mo <u>n</u> .	Axis Signal mon.	Erro <u>r</u> mon.
Data management				
#Para <u>m</u> eter	Table data	<u>I</u> /0		
Maintenance				
#Parameter viewer	Table viewer(<u>K)</u>	I/O viewer(J)	<u>B</u> ackup	Version info.
-				

Figure 9: Main screen

2. User need set the servo stiffness to "8" as shown below than click "Regist". Soon after that click on "Register parameter".

Parameter setting		×
Register parameter Function parameter	ervo tuning Filter setup Signal monitor	E <u>s</u> it
Integral limit recalculation	<u> ⊟</u> egist	<u>U</u> pload
		#Parameter list
#000 Load inertia/Load mass	36	-
#001 Servo stiffness setup	8	#Monitor list
	Hegist	
Velocity control parameter		
#002 Velocity control bandwidth #1	105 · + #003 Velocity control bandwidth #2 20 · +	
#004 Integral time for velocity control #1	1000 + + #005 Integral time for velocity control #2 1000 + +	
#006 Velocity integral limiting value #1	0 + # #007 Velocity integral limiting value #2 10000 + +	
Position control parameter		
#008 Position control bandwidth #1	26 #009 Position control bandwidth #2 1	
#010 Integral time for position control #1	10000 · + #011 Integral time for position control #2 10000 · +	
#012 Position integral limiting value #1	100000 · + #013 Position integral limiting value #2 10000 · +	
Feed forward parameter		
#U14 Position feed forward percentage	49	
	15 . +	
#015 Velocity feed forward percentage		

Figure 10: Parameter setting

3. Direct to "System setup register 1" and follow the value as show below. After changing the value click on "Regist" and exit.

🦉 Parameter setting				×
Register parameter Function	parameter Servo tuning Filter setup Sign	al monitor		E <u>x</u> it
C Error setup register 1			<u>R</u> egist	Upload
#038: AAAABAZA C Error setup register 2 #039:22220ABB C System setup register 1] #110: F3000DA3 C System setup register 2 #098: 00030002 C System setup register 3 #099: 008000F7	System setup register 1 Setup of AC power monitoring cycle Serial I/F select for jog operation High speed processing select for start signal Pulse scale select for coin window Command unit value held in servo-on Brake during servo-of Z-pulse hysteresis on non-accurate edge Select coordinate Coodinate commanded direction setup Command pulse type Monitor pulse type External analog input range Select position control mode Select velocity control mode Select velocity control mode Select basic control mode Select basic control mode Select basic control mode Select velocity control mode	170msec Valid Valid Command unit Invalid Valid Valid Rotation coordinate Pos. Dir. = Cw/ PLS-SIGN A-B +/- 6V I-P control Proportional control Proportional control Position control mode Disable FF		# <u>P</u> arameter list # <u>M</u> onitor list

Figure 11: Parameter values

4. In main menu click on "Table data".

饕 DrvX3 Support Tool -	[GIII]			×
<u>File H</u> elp				
= 33 ?				
COMMUNICATIO	ON NC			
Port	Channel			Simulation mode
C Offline	Single UR1BG	3-060N-%%C-2T*-%	Disconnect	🔘 Motor 🅥 Amp.
🖲 Online 📔 💌	C Multi	V	Initialize	Mode config
MENU				
Operation				
Drive	<u>I</u> erminal			
Display				
	#Param <u>e</u> ter mon.	1/0 mo <u>n</u> .	Axis Signal mon.	Erro <u>r</u> mon.
Data management				
#Para <u>m</u> eter	Tab <u>l</u> e data	[/O		
Maintenance				
#Parameter viewer	Table viewer(<u>K)</u>	I/O viewer(J)	Backup	Version info.

Figure 12: Main screen

5. Enter three of the values as below by clicking twice on each parameter to edit it. The others are change to the value as shown.

🍃 Ta	ble setup						
N	Code	M-fun	M-func.par	Coin	Conti	Next table 🔺	E <u>x</u> it
000	Dwelling	Invalid	Invalid	Invalid	Invalid		
001	Homing operation	Invalid	Invalid	Invalid	Invalid		Edit
002	INC positioning	Invalid	Invalid	Valid	Valid	7	I
003	Dwelling	Invalid	Invalid	Invalid	Invalid		l able <u>c</u> opy
004	Dwelling	Invalid	Invalid	Invalid	Invalid		
005	Dwelling	Invalid	Invalid	Invalid	Invalid		l able <u>p</u> aste
006	Dwelling	Invalid	Invalid	Invalid	Invalid		
007	Dwelling	Invalid	Invalid	Valid	Valid	2	i able <u>d</u> elete
008	Dwelling	Invalid	Invalid	Invalid	Invalid		
009	Dwelling	Invalid	Invalid	Invalid	Invalid		
010	Dwelling	Invalid	Invalid	Invalid	Invalid		
011	Dwelling	Invalid	Invalid	Invalid	Invalid		
012	Dwelling	Invalid	Invalid	Invalid	Invalid		
013	Dwelling	Invalid	Invalid	Invalid	Invalid		
014	Dwelling	Invalid	Invalid	Invalid	Invalid		
015	Dwelling	Invalid	Invalid	Invalid	Invalid		
016	Dwelling	Invalid	Invalid	Invalid	Invalid		
017	Dwelling	Invalid	Invalid	Invalid	Invalid		
018	Dwelling	Invalid	Invalid	Invalid	Invalid		
019	Dwelling	Invalid	Invalid	Invalid	Invalid		
020	Dwelling	Invalid	Invalid	Invalid	Invalid		
021	Dwelling	Invalid	Invalid	Invalid	Invalid		
022	Dwelling	Invalid	Invalid	Invalid	Invalid		
023	Dwelling	Invalid	Invalid	Invalid	Invalid		
024	Dwelling	Invalid	Invalid	Invalid	Invalid		
025	Dwelling	Invalid	Invalid	Invalid	Invalid	🔻	

Figure 13: Table setup

6. This is how user can change the value. By clicking twice on a parameter, a popup will appear and there is where user can change the value. Below is the value specified for "Homing operation". After altering the values, user must click "Regist".

饕 Table setup				×
No. 1				Cancel
Table register				Regist
M-function Invalid M-ft		Coin waiting Unvalid	-	
Continue Invalid	Next table			0003
Table data0				,
Homing direction	- direction	•		0A00
Coin window	#90:Coin width-0	•	9 Regist	
Select acceleration time	#72:Acceleration time-0	▼ 10	000 Regist	
Select deceleration time	#76:Deceleration time-0	• 10	000 Regist	
Select acceleration type	Constant acceleration	•		
Select deceleration type	Constant acceleration	•		
Hardware EOT limit active in homing operation	Disable	-		
Enable home sensor	Enable	-		
Enables the home sensor during EOT search	Disable	-		
Select home sensor inside	Inside	•		
				0000000
				,

Figure 14: Homing operation 7. Same goes for "INC positioning" setup. Below are the values of it.

o. 2 Table register						Cancel
Code INC positionin	g	•				Hegist
M-function Invalid	▼ M-ft	nc.parallel Invalid 🔽	Coin waiting	Valid	–	
Continue Valid	_ _	Next table No.07 Dwelling		,	J	C705
able data0						·
	Coin window	#91:Coin width-1	•	40	Regist	5009
Select ad	celeration time	#73:Acceleration time-1	•	16	Regist	
Select de	eceleration time	#77:Deceleration time-1	-	16	Regist	
Select ac	celeration type	Constant acceleration	•			
Select de	celeration type	Constant acceleration	•			
	Select velocity	#65:Feeding velocity-1	-	1499999	Regist	
Optional move direction for rota	tion coordinate	Type0 [Short cut]	•			
D	irect or indirect	Direct	•			
	l					
able data1						1
R	elative position		-50000			FFFF3CB0

Figure 15: INC positioning

8. Again same for "Dwelling" number "007". Below are the values of it.

🦉 Table setup					X
No. 7					(Cancel)
Table register					Regist
Lode Dwelling	 M fune parallel 		Coin waiting Malid		
Continue Valid	Nevt table	No 02 INC positioning	Contrivialiting Valid		C210
Table data0		No.02 Mic positioning			J C210
Dwe	ell time[msec]		100		0064
	,				
					0000000
					1 0000000

Figure 16: Dwelling screen

9. User than need to exit to the main screen and click on "I/O".

饕 DrvX3 Support Tool - [GIII]	×
Eile Help	
COMMUNICATION	
Port Channel	- Simulation mode
C Offline G Single UR1BG3-060N-%%C-2T*-% Disconnect	🔘 Motor 🔘 Amp.
Online Imitialize	Mode config
MENU	
Operation	
<u>D</u> rive <u>I</u> erminal	
Display	
Qscilloscope #Parameter mon. I/O mon. Axis Signal mon.	Erro <u>r</u> mon.
Data management	
#Parameter Table data !/0	
Maintenance	
#Parameter viewer Table viewer(K) I/O viewer(I) Backup	<u>V</u> ersion info.

Figure 17: Main screen

10. Below is the popup of I/O window. Values as shown need to be set.

🦉 I/O s	ettin	g	×
Тур	e Phy	ysical I/O 💌 I/O ኲ 💌 Block Block0-1 💌	E <u>x</u> it
Physica	al 1/0 -		Begist
Block	Bit	Assignment logic I/O name Pos. logic	
10-		3-4 ERROR RESET	
	-1	3-1 SERVO	
	-2	0-0 START	
	-3	0-2 ABORT	
	-4	1-0 IN_CODE0	
	-5	1-1 IN_CODE1	
	-6	Not assign 🔽 🔽	
	47	Not assign	
1	-0	Not assign 🔽 🔽	
	-1	Not assign	
	-2	Not assign	
	43	Not assign	

Figure 18: I/O setting

11. Than user will need to set "I/O" to "Out" and again follow the values as shown than exit to main menu.

饕 I/O setting	×
Type Physical I/O 🔽 I/O 🔽 🖌 Block Block0 💌	E <u>x</u> it
Physical I/0 Block Bit Assignment logic I/0 name Pos. logic 0 Not assign 10 10 - 1 SERVO READY	<u>R</u> egist
-2 0-6 BUSY ▼	
-4 OVER SPEED ▼	
☐5 Not assign	

Figure 19: I/O setting

12. User now need to enter "Terminal"

🈼 DrvX3 Support Tool -	[GIII]			×
<u>File H</u> elp				
I I ?				
COMMUNICATIO	ON NC			
Port	Channel			Simulation mode
C Offline	Single UR1BG	3-060N-%%C-2T*-%	Disconnect	🔘 Motor 🌔 Amp.
Online 1	C Multi	V	Initialize	Mode config
MENU				
Operation				
<u>D</u> rive	<u>T</u> erminal			
Display				
<u>O</u> scilloscope	#Param <u>e</u> ter mon.	1/0 mo <u>n</u> .	Axis Signal mon.	Erro <u>r</u> mon.
Data management				
#Para <u>m</u> eter	Table data	<u>I</u> /0		
Maintenance				
#Parameter viewer	Table viewer(<u>K)</u>	1/0 viewer(J)	Backup	<u>V</u> ersion info.

Figure 20: Main screen

13. At the terminal window, key in "@5.0" to set the controller to serial comm.

🧏 Terminal				
@5:0	•	<u>R</u> esend	<u>S</u> end	E <u>x</u> it
			<u> </u>	<u>C</u> lear records
				# <u>P</u> arameter list
				# <u>M</u> onitor list
				<u>C</u> ommnad list
			_	
LT				

Figure 21: Terminal window

14. Than key in "@3:1" for homing purpose and "##112=1000000" for one resolution setting.

饕 Terminal			
##112=1000000	▼ <u>R</u> esend	<u>S</u> end	E <u>x</u> it
@5:0		<u> </u>	<u>C</u> lear records
@3:1 ->B00			# <u>P</u> arameter list
			# <u>M</u> onitor list
			<u>C</u> ommnad list
		T	
1			

Figure 22: Homing

15. Lastly is to reset driver software with the command "@96"

饕 Terminal				
@96	•	<u>R</u> esend	<u>S</u> end	E <u>x</u> it
@5:0 ->B00			<u>^</u>	<u>C</u> lear records
@3:1 ->R00				# <u>P</u> arameter list
				# <u>M</u> onitor list
				<u>C</u> ommnad list
			▼ 	

Figure 23: Resetting

16. Disconnect the servo from driver at the main menu and than reconnect back again.

🍇 DrvX3 Support Tool -	[GIII]			X
Eile Help				
B B ?				
COMMUNICATIO	<u>N</u>			
Port	Channel	ſ]	Simulation mode
C Offline	Single UR180	63-060N-%%C-2T*-%	Disconnect	🕥 Motor 🕥 Amp.
C Online 1	C Multi		Initialize	Mode config
MENU				
Operation				
Drive	<u>T</u> erminal			
Display				
<u>O</u> scilloscope	#Param <u>e</u> ter mon.	1/0 mo <u>n</u> .	Axis Signal mon.	Erro <u>r</u> mon.
Data management				
#Para <u>m</u> eter	Table data	<u>I</u> /0		
Maintenance				
#Parameter viewer	Table viewer(<u>K)</u>	1/0 viewer(<u>J</u>)	<u>B</u> ackup	⊻ersion info.

Figure 24: Disconnect and Connect

17. Than go to "Terminal" and key in "@5:0" for serial communication than exit. Now user needs to click on "Drive" for auto tuning setting.

PrvX3 Support Tool - Eile Help Eile Help	[6111]			×
COMMUNICATION Port C Offline © Online	Channel © Single UR1BG3- © Multi	060N-%%C-2T*-%	Disconnect Initialize	Simulation mode Motor Amp. Mode config
MENU Operation Drive				,,
	#Param <u>e</u> ter mon.	1/0 mo <u>n</u> . [/0	Axis Signal mon.	Error mon.
Maintenance #Parameter viewer	Table viewer(<u>K)</u>	I/O viewer(J)	<u>B</u> ackup	Version info.

Figure 25: Main screen

18. Popup window will appear and click on "Drive" than "Regist". Exit the window and return to main menu.

🧏 Operation	×
Table operation JOG Auto-tuning operation Test operation	
Drive(D) Abort(A) Servo-on Servo-off	Controller side(<u>C</u>)
Table No. No.61 Auto-tuning operation	

Figure 26: Auto tuning

19. Open "Terminal" again from main menu and key in "@5:0" follow by "@3:1" for homing purpose.

🦉 Termir	nal			
@3:1	-	<u> </u>	<u>S</u> end	E <u>x</u> it
@5:0 ->R00			<u> </u>	<u>C</u> lear records
				# <u>P</u> arameter list
				# <u>M</u> onitor list
				<u>C</u> ommnad list
			<u>_</u>	
			Þ	

Figure 27: Homing

20. Than start tuning by key in "@3:2" as shown. The servo motor should now run single index continuously.

🦉 Term	ninal			_		_ 🗆 🗵
@3:2		•	<u>R</u> esend		<u>S</u> end	E <u>x</u> it
@5:0 ->B00					A	<u>C</u> lear records
@3:1 ->R00						# <u>P</u> arameter list
						# <u>M</u> onitor list
						<u>C</u> ommnad list
					<u> </u>	
					F	

Figure 28: Start single index

21. Select "Oscilloscope" at main menu to view timing graph.

饕 DrvX3 Support Tool -	[6111]			×
<u>File H</u> elp				
🔳 👪 🤶				
COMMUNICATIC	<u>N</u>			
Port	Channel			Simulation mode
C Offline	ⓒ Single UR1BG3-060	N-%%C-2T*-%	Disconnect	🔘 Motor () Amp.
C Online 1	C Multi	*	Initialize	Mode config
MENU				
Operation				
<u>D</u> rive	<u>I</u> erminal			
Display				
<u>O</u> scilloscope	#Param <u>e</u> ter mon.	1/0 mo <u>n</u> .	Axis Signal mon.	Erro <u>r</u> mon.
Data management				
#Para <u>m</u> eter	Table data	Ī\O		
Maintenance				
#Parameter viewer	Table viewer(<u>K)</u>	/0 viewer(<u>J)</u>	<u>B</u> ackup	⊻ersion info.

Figure 29: Main menu

22. Click "Start" to start collecting information. A proper tuned graph should looks about the same as Figure 31.



Figure 30: Oscilloscope



Figure 31: Expected result

- 23. There are three main values tuner can use to tune the servo motor.
 - a. #12: Integral Limit
 - b. #14: Position Feed Forward
 - c. #15: Velocity Feed Forward
- 24. Each of these main values corresponds to a certain curve at the graph. Refer snapshoot below.



Figure 32: Corresponding values

25. Given an example below. The values that user need to increase is "#15". In this case the values should reduce to lift up the line. E.g. type "##15=20" in the terminal window and enter. The same way as shown in Figure 22.



Figure 33: Dampen to high

- 26. Minor adjustment can be made by using the parameter below. Minor value adjustment to these values can create big impact to the result. So use it carefully.
 - a. #2: Velocity Control
 - b. #8: Position Control
- 27. The table below summaries the values normally involves and effect of adjusting it.

Parameter	Default	Value Increase	Value Decrease
#2	105	Lesser time	More time
#8	26	Damping high	Damping low
#12	250000	Damping high	Damping low
#14	50	Damping high	Damping low
#15	15	Damping high	Damping low

Table 1: Summaries of parameter values

28. Parameter "#2" and "#8" normally are used to correct minor noise as shown below.



Figure 34: Noise distortion

29. When an expected graph is acquired, user need to measure the duration of the active pulse. The value in "dT" should be around 57-60 milliseconds. To measure the graph accurately, user will need to "Stop" the graph execution and click on "Cursor" to move the "T1" and "T2" line as shown.



Figure 35: T1 line in position



Figure 36: T2 line in position

- 30. Figure 36 also represent the duration measured. If the duration met the user's expectation, "Exit" the oscilloscope else start the oscilloscope and return to terminal window and start fine tuning again.
- 31. Command to stop the servo is "@2" as shown and when user finish tuning the servo, final confirmation need to be done by entering "##2, ##8, ##12, ##14 and ##15" to save all the values entered.



Figure 37: Stop servo

🦉 Terminal				
##15		<u>R</u> esend	<u>S</u> end	E <u>x</u> it
@2 ->B00			<u> </u>	<u>C</u> lear records
##2 ->B1D VelFreg1:105				# <u>P</u> arameter list
##8 ->R1D PosFreg1:26				# <u>M</u> onitor list
##12 >R1D PosIntLim1:100000				<u>C</u> ommnad list
##14 ->R1D Pos_FF:49				
	J			
			T	
T			Þ	

Figure 38: Saving final changes

32. Exit everything and return to main menu. Finally, click "Disconnect" to end the session and plug out any unnecessary cables that are used to tune the servo motor.