

ACS to Horner HMI Using Modbus TCP





For this Tech Note we have setup a basic integration of a Horner HMI to an ACS servo drive using the Modbus TCP communication protocol. The process would be the same for either ACS servo or stepper.

Hardware:

Tolomatic ACS Servo drive with Modbus TCP capabilities (36049663)

Horner XL7e-HW-XWIE2BB

PC

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- Click 'Config' to the right of the LAN1 Network Port......7
- Open the Network window for ETN1/1 and set the Update 5.

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Software:

Tolomatic Motion Interface Version 3.7.0.15 & over Cscape Version 9.60

	Interval to 20mSec and the Reacquire time to 20mSec 7
6.	Open the Devices window for ETN1/1 and Add a new device
7.	Open the Scan List for ETN1/1 and Add a new register to scan
8.	Enter all the remaining registers to be scanned by the HMI. Click OK for the Scan List,
9.	Open the graphics portion of the software to start the reading and writing of each register
10.	To monitor individual bits, such as Enabled, use the corresponding register with a decimal before the bit number (%R00003.1)
11.	This example uses a Switch to toggle various bits to control the ACS drive
12.	Once homed, the ACS drive will need all of the motion data to be loaded for the first moves
13.	To test the program, save it and download it to the HMI (Program>Download)

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Certified site: Hamel, MN

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SETUP THE ACS DRIVE

1. Connect to the ACS drive using Tolomatic Motion Interface.





3. Configure to run in Modbus TCP mode.

Tolomatic Motion Interface	
File Tools View Help	
i 🔁 🖵 🔪 🗟 i 🗍 🖉 🔛 🎚 🖻 🔁 🜃 🚥 🛛 🔪 🔪	
Drive Actuator Motor Mode Select I/O Fault Safety/Limits Shome Setup Mode Setup	~
Operating Mode	
Index Move	
Analog Position	
O Pneumatic	
Modbus TCP 192.168.0.100	
US Connected: COURT2 38460 bath, Current position: 0.878	

4. Configure the IP address (Tools > Ethernet Setup) Click OK.

ACS Ethernet (TCP/IP) Properties	
Ethemet Settings Obtain an IP Address automatically IP Address Subnet Mask 255 . 255 . 0 Ethemet Status Link Status: Duplex Mode:	Up Full
Default Gateway 192 . 168 . 0 . 1 Speed (Mbps): Enable UDP Socket Support MAC Address 00:04:A3:E8:0A:71	100.00
OK Test Default Cancel	.:



5. Work through the remainder of the ACS drive configuration for a complete setup. Write all of the settings to Drive Flash.





SETUP THE HORNER HMI

1. Connect the PC to the HMI.



2. Go to the I/O Names to enter the local registers which will be populated from the ACS drive (Program > I/O Names).

I/	O Names			x
	Point	Туре	Name	
	%M00001	1-bit	ACS_Input_1	
	%M00002	1-bit	ACS_Input_2	
	%M00003	1-bit	ACS_Input_3	<u>C</u> opy All
	%M00004	1-bit	ACS_hoput_4	
	%MUUUU5 %M000000	1-bit	ALS_Input_5	<u>P</u> aste
	%MUUUU6 %M00007		ACO June 7	
	%M00007 %M00009	1-bit	ACS_Imput_7	
	2M00011	1-bit	ACS_INPA_0	Add
	%M00012	1-bit	ACS Output 2	
	%M00013	7-bit	ACS_Output_3	<u>E</u> dit
	%M00014	1-bit	ACS_Output_4	
	%R00001	16 bit	ACS_Current_Position	<u>H</u> emove
	%R00003	32-bit	ACS_Drive_Status	Where
(%H00005	32-bit	ACS_Drive_Faults	
	%FU0005	32-bit	ACS_Drive_Faults	
N	%R00000	32-DIR TE-Fit	ACS_Drive_Faults	
	XB00010	16-bit	ACS_Digital_Iniputs	
	%R00011	1/6-bit	ACS Analog Input	
	%R00013	16-bit	ACS_Analog_Output	
	%R00021	16-bit	ACS_Commands	
	%R00022	16-bit	ACS_Move_Select	
	%R00023	32-bit	ACS_Target_Position	
	%R00023	32-bit	ACS_Target_Position	
	%HUUU25	32-bit	AUS_Larget_Velocity	
	%R00025	32-Dit	ALS_1 arget_Velocity	Cancel



The Type needs to match the size of each parameter to be stored

I/O Name	
Address	2R00001 -
<u>T</u> ype:	16-Bit •
<u>N</u> ame	ACS_Current_Position
<u>C</u> omment	FLOAT
u.	
3. Open	the Hardware Configuration window.
Hardware Co	onfiguration
Controller Loc	al 1/0 CAN1 (CSCAN) 1/0 CAN2 (CSCAN) 1/0 LAN1 1/0 LAN2 1/0
Series	XL Series Description:
Device Typ	Ne XL7e
Model #:	HEXW1E2 Display Type: 480 by 800 LCD
Network	Ports Keyped Type: 5 function keys
CAN1	SCAL Config Program Memory: 1024 K Bytes
CAN2	CAN Copying Network Type: CsCAN
LAN1	N300 Advanced Ladder Functions Supports Analog Data
LAN2	Config Real Time Clock Support Supports Retentive Data
Serial Ro	urts Config
(+)	
	Auto Config
	OK Cancel Apply



4. Click 'Config' to the right of the LAN1 Network Port.

Set the IP address, Net Mask and Gateway for the HMI under the Register Usage.

Check the Modbus TCP Slave box and pick the Modbus Tcp/lp Client under Protocol Support.

LAN1 Configuration			
Register Usage			
D	efault Settings	Register	Get settings from
IP Address: 192	. 168 . 0 . 220	Name:	Configuration 🔽 🗆 Use CAN ID for last Octen
Net Mask: 255	. 255 . 255 . 0	Name:	Configuration
Gateway: 192	. 168 . 0 . 1	Name:	Configuration
Status:		Name:	
Version:		Name:	
		,	
D			
- Resident Protocols			
LCMP (Ping	g)		
EGD (Ethe	ernet Global Data)		Configure Selected Protocol
■ SRTP Sia ■ Modbus T	ive (90-30 Service CP Slave	Request)	
Ethernet/IF	p		
FTP (File S	Server)		
HTTP (We	eb Server)		
ASCILOVE	ir TCP/IP		
- Downloadable Protocols			
ETN1/1 Mo	dbus Tcp/Ip Client v	3.12 💽	Network Devices Soan List
ETN1/2 - N	lone	-	Network Demeas Scan List
			OK Cancel

5. Open the Network window for ETN1/1 and set the Update Interval to 20mSec and the Reacquire time to 20mSec. The scan time settings is often application specific and will require adjustment to allow for additional registers. Notice the Protocol Help button for additional details. Click OK

Network Config (Modbus Tcp/Ip Clien	t
Port Configuration	
Minimum Part Id:	\sim
Maximum Port Id: 4096	
Keep Alive Time: 1000	Retries: 100 (0-255)
$(\land))$	Timeout 10000 mSec
	Sfave Speed: Fast
Update Scan	
Automatic	Personalizations los
appare intervan [20] insec	heacquire i ime: 120 misec
C Manual	
ID Select: 0 Name:	<u>✓</u> 16-BIT
Master ID / Address	
Address: 0	
Status	
Register: 0 Name:	▼ 4 х эз-ел
Protocol Help	OK Cancel



6. Open the Devices window for ETN1/1 and Add a new device.



Enter the IP Address and configure the Device Options to have the Modicon PLC 6-Digit Addressing selected. Click OK for Device Config and click OK for the Device List.

Device Config			\bigvee	
Device	\bigcap			
Name: ACS Drive				
Get Target IP address from	register			
IP Address: 192 . 168	0 100	\frown		
Get Target Port Id from regi	sters			
Port 502	ha			
E Bemote Slave Id				
Device Options				
Swap Words on 32 bit da	ingle vegister request			
Device Type: Modicon Pl	6-Digit Addressing			
Status				
Enable				
Address: 2 x	16-BIT			
Name:		F		
	.			
C Stop on Error	Hetry on Error			
	OK	Cancel		



7. Open the Scan List for ETN1/1 and Add a new register to scan.

lex	Local Name	Register	Туре	Dev Name	ID	Target	Length			
	ACS_Current_Position	%R00001	<	ACS Drive	192	304001	2	Ad	d 🗾	
	ACS_Digital_Inputs	%R00008	<	ACS Drive	192	304008	1	-		•
	ACS_Drive_Status	%R00003	<	ACS Drive	192	304003	1 (DW)	Dele	ete	
	ACS_Fault_Status	%R00005	<	ACS Drive	192	304005	1			
	ACS_Digital_Outputs	%R00010	<	ACS Drive	192	304010	1	Con	iig 🔪	
	ACS_Analog_Input	%R00011	<	ACS Drive	192	304011	2			
	ACS_Analog_Output	%R00013	<	ACS Drive	192	304013	2		-	
	ACS_Commands	%R00021	<>	ACS Drive	192	414001	1	E dit Na	ames	
	ACS_Input_1	%M00001	<	ACS Drive	192	100100	1 (b)			
	ACS_Move_Select	%R00022	<>	ACS Drive	192	414002	1			
	ACS_Target_Position	%R00023	<>	ACS Drive	192	414003	2	\wedge		
	ACS_Target_Velocity	%R00025	<>	ACS Drive	192	414005	2			
	ACS_Target_Accel	%R00027	<>	ACS Drive	192	414007	2			
	ACS_Target_Decel	%R00029	<>	ACS Drive	192	414009	2			
	ACS_Target_Force	%R00031	<>	ACS Drive	192	414011	2			
	ACS_Target_MotionType	%R00034	<>	ACS Drive	192	414014	1			
	ACS_Digital_Output	%R00036	<	ACS Drive	192	414016	1			
								Con		
								Can	uer	
	Filter Bu Device:									

The Device Name will be selected. Now enter the register to monitor and the length based on the ACS Modbus Programmers guide. The value can be stored to a local Register available from the drop down list or by entering the corresponding local register. The Update Type should be either Polled Read or Polled Read/Write based on the register type. Click OK.

The Horner PLC uses Modicon PLC 6-Digit Addressing. As such, for Reading Input registers you must append '30' to the start of the register (i.e. Current Postition = '304001'; and drive faults = '304005'). To write to holding registers, you must append '4' to the start of the register (i.e. Drive Commands = '414001'; and Target O Motion Type = '414014').

Data Mapping	X
Target	5
Device Name: ACS Drive	(192.168.0.100)
Device Register: 304001	>
Length: 2	$\overline{\langle}$
Local	
Register: %R00001 Na	me: ACS_Current_Position
Polled Read	C Triggered Read
Polled Read/Write	Inggered Write
C Polled Read/Write Init	
Trigger Register:	Name:
	OK Cancel



8. Enter all the remaining registers to be scanned by the HMI. Click OK for the Scan List, OK for the LAN1 Configuration, and OK for the Hardware Config.

P	Scan Lis	t (Modbus Tcp/Ip Clien	t)					_	<u> </u>		
Ec	dit View	Sort									
		- [1	1-		[-		1		
	Index	Local Name	Register	lype	Dev Name	שו	Larget	Length			
0)	ACS_Current_Position	%R00001	<	ACS Drive	192	304001	2	Add		
l i		ACS_Digital_Inputs	%R00008	<	ACS Drive	192	304008	1			
2	2	ACS_Drive_Status	%R00003	<	ACS Drive	192	304003	1 (DW)	Delete		
3	3	ACS_Fault_Status	%R00005	<	ACS Drive	192	304005	1		F	
4	1	ACS_Digital_Outputs	%R00010	<	ACS Drive	192	304010	1	Config		
5	5	ACS_Analog_Input	%R00011	<	ACS Drive	192	304011	2			
6	6	ACS_Analog_Output	%R00013	<	ACS Drive	192	304013	2			· /
7	7	ACS_Commands	%R00021	<>	ACS Drive	192	414001	1	Edit Names		
8	3	ACS_Input_1	%M00001	<	ACS Drive	192	100100	1 (b)			
9	9	ACS_Move_Select	%R00022	<>	ACS Drive	192	414002	1			
1	10	ACS_Target_Position	%R00023	<>	ACS Drive	192	414003	2			
1	1	ACS_Target_Velocity	%R00025	<>	ACS Drive	192	414005	2			
1	12	ACS_Target_Accel	%R00027	<>	ACS Drive	192	414007	2			
1	13	ACS_Target_Decel	%R00029	<>	ACS Drive	192	414009	2			
	4	ACS_Target_Force	%R00031	<>	ACS Drive	192	414011	2		~	
1	15	ACS_Target_MotionType	%R00034	<>	ACS Drive	192.	414014	1			
1	16	ACS_Digital_Output	%R00036	<	ACS Drive	192	414016	1			
									Canaal	1	
14			111	_					Lancel		
		Filter By Device:						V	014	1	
								1	UK		
_				-							

9. Open the graphics portion of the software to start the reading and writing of each register.

In this example we had two pages on the HMI, one for status and a second for control.



Start by creating a Numeric Data window and selecting the internal register %R00001 for ACS drive position. The display format should be Real/Floating Point and the units are Metric.



Once all of the text and format changes have been entered, Click OK.

Numeric Data Properties	
Controller Register Data Source: Internal registers Address: %R00001 Register Width: 32-Bit	
Dienlau Format	
Format Real / Floating Point 12345. 1234	
Engineering Units: mm Image: Zero Filled Font: San Serif 15 Scaling >>>	
Edit/Write F Enabled Minimum -10000000000.000000C * Magimum 100000000000000000000000000000000000	
Display Properties	
Legend >>> Line Color >>> Data Color >>>	
Display Style : Classic Style	
OK Cancel	\bigcirc

10. To monitor individual bits, such as Enabled, use the corresponding register with a decimal before the bit number (%R00003.1).

			-				
Indicator Properties							X
Controller Register			1				
Data Source: Internal regis	ters	~			•	r	
Address: %R00003.1	1	J	Registe	er Width:	1-Bit 🔹	-	
Name:					Ŀ	·	
Indicator Type:							
Bound		🔽 Le	gend Plate	:			
		🖂 3D	Bezel				
Display Properties							
Attributes >>>	Bac	kground C	olor >>>				
Legend >>>		Line Color	>>>				
		ON Color :	>>>				
		DFF Color	>>>				
					ок	С	ancel



11. This example uses a Switch to toggle various bits to control the ACS drive. This is an example of the Enable bit (%R00021.1). The drive will enable when switched to active. There are some combinations that will not work based on the combination of bits depressed so plan accordingly. See Tolomatic Modbus Programmers Guide (#3600-4169), Read Holding Register for more detail.

Switch Properties		×		
Controller Register Data Source: Internal registers				\land
Address: %R00021.1	> Register Width: 1-Bit 🔽		$/2 \setminus$	$\langle \rangle$
Keypress Source	_			\bigvee
C Auxiliary Register Address: Name: Name:				
Cursor Selectable Touch			$\rangle \land$	>
Switch Type: Standard	Legend Plate		\land	
Action: Toggle 💌	3D Bezel		\checkmark	
	Show Inside Line Detail			
Indicator Properties >>				
Display Properties	$\left(\right)$			
Attributes >>> Backgrou	nd Color >>>			
Legend >>> Line (Color >>>			
	Canad			
		-		
(

12. Once homed, the ACS drive will need all of the motion data to be loaded for the first moves. Target Position, Velocity, Acceleration, Deceleration, Force and Motion Type are required to control the ACS from the HMI screen.

ACC DBILE	CONTROL		1.1		1.1					1.1		(1,1)	• •	
TOS PRIVE	CURTREL		· · · · · · · · · · · · · · · · · · ·			· · · · ·		· · ·		· · · · · · · · · · · · · · · · · · ·				
Enable	Target Position		· · · · · · · · · · · · · · · · · · ·							· · · · · · · · · · · · · · · · · · ·				
	-#########.####mm	· · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · ·	· · ·	· · ·	· · ·	· · · · · · · · · · · · · · · · · · ·	· · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
Start	Target Velocity	· · ·	· · ·	· · ·	· · ·	· · ·		· · ·	· · ·	· · ·	· · ·	· · · · · · · · · · · · · · · · · · ·		
	-########.####mm/s	· · ·	· · ·	· · ·	· · ·	· · ·			E	E-ST	TOF	>		
Home	Target Accel	· · ·	· · · · · · · · · · · · · · · · · · ·	· · ·	· · ·	· · ·	· · ·							•
	-############mm/s^2	· · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · ·	· · ·							
	Target Decel	· · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · ·	· · ·	· · ·					//		
	-########.####mm/s^2	· · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · ·	· · ·	· · · · ·	•••							
· · · · · · · · · · · · · · · · · · ·	Target Force	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · ·	· · · · · · · · · · · · · · · · · · ·	· · ·	· · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·	· · ·		•
	-###.##%	· · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · ·		ACS I	DRIVE	E STA	TUS		-
· · · · · · · · · · · · · · · · · · ·	Target Motion Type	· · ·	· · · · · · · · · · · · · · · · · · ·	· · ·	· · ·	· · ·				5		1		
	#				· · ·									
					1.0			10.00		1.0		100		



An example of the Target Position properties is as follows (%R00023).

Numeric Data Properties
Controller Register Data Source: Internal registers Address: %R00023 Name: ACS_T arget_Position
Display Format Format Real / Floating Point Image: State of the state of
Font: San Serif 15
C XXX.X_ C XXX.X_ C XXX.X Edit/Write Image: Constraint of the second seco
Maximum 1000000000.0000000 Display Properties
Legend >>> Line Galor >>> Data Color >>> Display Style : Plassic Style
EK Cancel

13. To test the program, save it and download it to the HMI (Program>Download).

Enable (Toggle) and Home (Momentary) the drive using the switches. The values for each move profile can be entered into the Targets and a Start Motion (Momentary) can be triggered to start motion. Keep in mind that the units are in metric.

COMPLETE!



ACS MODBUS Register Quick Reference

Modicon PLC Modbus Protocol Spec		Data Format Dita		Nama			
6-Digit Addressing		spec	Data Format	BITS	Name	Access	
	Function Code	Register					
	1	100	BOOLEAN	1	Digital Input 1	Read Only	
	1	101	BOOLEAN	1	Digital Input 2	Read Only	
	1	102	BOOLEAN	1	Digital Input 3	Read Only	
	1	103	BOOLEAN	1	Digital Input 4	Read Only	
	1	104	BOOLEAN	1	Digital Input 5	Read Only	
	1	105	BOOLEAN	1	Digital Input 6	Read Only	
	1	106	BOOLEAN	1	Digital Input 7	Read Only	
	1	107	BOOLEAN	1	Digital Input 8	Read Only	
304001	3	4001-4002	FLOAT	32	Current Position	Read Only	
304003	3	4003-4004	LONG	32	Drive Status	Read Only	
304003.1			BOOLEAN	1	Drive Enabled	Read Only	
304003.2			BOOLEAN	1	Drive Homed	Read Only	
304003.3			BOOLEAN	1	Drive in Motion	Read Only	
304003.4			BOOLEAN	1	Estop Active	Read Only	
304003.21			BOOLEAN	1	Brake Not Active	Read Only	
304005	3	4005-4006	LONG	32	Drive Faults	Read Only	
304005.1			BOOLEAN	1	Positive Limit	Read Only	
304005.2			BOOLEAN	1	Negative Limit	Read Only	
304005.3			BOOLEAN	1	Estop	Read Only	
304005.4		- / /	BOOLEAN	1	Position Error	Read Only	
304005.5		>	BOOLEAN	1	Feedback Error	Read Only	
304005.6	6		BOOLEAN	1	Overcurrent	Read Only	
304005.7			BOOLEAN	1	Motor Overtemp	Read Only	
304005.8			BOOLEAN	1	Drive Overtemp	Read Only	
304005.9			BOOLEAN	1	Drive Overvoltage	Read Only	
304005.10			BOOLEAN	1	Drive Undervoltage	Read Only	
304005.11	5		BOOLEAN	1	Flash Error	Read Only	
304008	3	4008	INTEGER	16	Digital Input	Read Only	
304010	3	4010	INTEGER	16	Digital Output	Read Only	
304011	3	4011-4012	FLOAT	32	Analog Input	Read Only	
304013	3	4013-4014	FLOAT	32	Analog Output	Read Only	
414001	4	14001	INTEGER	16	Commands	Read/Write	
414002	4	14002	INTEGER	16	Move Select (0-16)	Read/Write	
414003	4	14003-14004	FLOAT	32	Target 0 Position	Read/Write	
414005	4	14005-14006	FLOAT	32	Target 0 Velocity	Read/Write	
414007	4	14007-14008	FLOAT	32	Target 0 Acceleration	Read/Write	
414009	4	14009-14010	FLOAT	32	Target 0 Deceleration	Read/Write	
414011	4	14011-14012	FLOAT	32	Target 0 Force	Read/Write	
414014	4	14014	INTEGER	16	Target 0 Motion Type	Read/Write	
414016	4	14016	INTEGER	16	Digital Output	Read/Write	
	5	1100	BOOLEAN	1	Digital Output 1	Read/Write	
	5	1101	BOOLEAN	1	Digital Output 2	Read/Write	
	5	1102	BOOLEAN	1	Digital Output 3	Read/Write	
	5	1103	BOOLEAN	1	Digital Output 4	Read/Write	