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Machine Configuration & Product Tracking – Data Management Improved by Barcodes

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In the past year, improving operator efficiency as well as production throughput and product tracking have become common requests from customers. I have assisted on these applications and both were able to be solved by implementing a barcode reader into a PLC automation system. There are two major application solutions we've identified.

First, machines have become ever more configurable. A machine operator needs to manage the many settings for each product coming down the line. These settings typically are managed and updated via the HMI page and could take minutes to update on a product change over. Imagine a system that requires an operator to get the work order paperwork, grab a barcode reader and scan, and then one second later the machine is configured for that product. I see two methods of this system working–either the barcode itself is holding the configuration parameters within its value, or the PLC controller supports recipe management where the barcode selects the specific product via the CSV parameter file.

Second, product tracking and validation of production and quality values are becoming the norm. Companies or regulatory organizations want to have each product's production specs available. Determining what product was being run at a specific time requires an operator to accurately enter the product value into the PLC. If this is done wrong, the data log files will have incorrect data, thus making tracking impossible. With a barcode data entry that can be automated, the code can be generated by the ERP system and the PLC logged data can close the loop on what was produced.

At Power/mation, we can assist in guiding your vital digital systems production value decisions. From implementing a barcode system, improving production throughput, and gaining system awareness to report generation. These are necessary for an efficient process automation application. Find our basic application guide in the following pages and reach out to your Power/mation Sales Representative for further questions.

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Horner OCS Working with Datalogic Handheld Barcode Reader





This guide provides step-by-step instuction for connecting a DATALOGIC Handheld Barcode to a Horner OCS via RS232 Serial ASCII protocol.

Contents:

- Hardware Requirements
- Serial Connection Diagram
- CSCAPE Serial Port Configuration & Sample Code
- Barcode Configuration
- Barcode Samples
- Bill Of Materials



Hardware Requirements

- Horner Automation OCS product can be selected here.
 - o https://hornerautomation.com/product-category/all-in-one-controllers/
 - Sample Projects for the XL7 or XLTe.





Micro OCS Series (5)

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- DATALOGIC Handheld Barcode Reader will need to be a RS232 version. The Industrial, drop on the floor, model is know as the PowerScan.
 - <u>https://www.datalogic.com/eng/retail-transportation-logistics/hand-held-scanners/powerscan-</u> 9100-pd-868.html
 - Sample project uses PowerScan 9100 Handheld Scanner with BC9030 Wireless Base Station.

PowerScan[™] 9100 Family

Linear Imager Bar Code Reader

PowerScan PD9130/PBT9100/PM9100



Connection Diagram 4.3 - Serial Communications MJ1/2 SERIAL PORTS Serial Comms Connection Diagram MJI: RS-232 w/Full Handshaking Horner XL7 MJ1/MJ2 OUT DATALOGIC BC9030 Cradle provides a multi-interface RX- / TX-IN / OUT IN / OUT **Phoenix Contact** connector cable and Power Supply. **D-SUB Gender Changer** DB9 RS232 Serial Connection 1652651 SIGNAL TXD RS232 RXD RS232 **Phoenix Contact** OV +5V @ 60mA OUT OUT NULL MODEM TX- RS485 TX+ RS485 OUT 2708753 RX-RS485 HE500CBL300 **Programming Cable**

- The Horner OCS has multiple serial ports. The MJ1 port will be used in this application. Note: any RS232 . serial port will function.
- For ease of connection to Horner OCS, use the HE500CBL300 programming cable
 - https://hornerautomation.com/product/optoisolator-12/ 0
 - Optional to create custom communication cable. A good accessory is the HE200MJ2TRM 0
- To swap the Transmit and Receive, a Phoenix Contact Null Modem is used 2708753
- To swap the connector gender, a Phoenix contact Gender Changer is used 1652651
- The DATALOGIC Barcode Cradle comes with a Multi-Interface cable.
 - 0 PM9501-HP910RBK20 or PM9100-910RBK20 Cable



CSCAPE Serial Port Configuration & Sample Code

• The serial port communication needs to be enabled within the logic of the controller. In the past, the serial port was the only method of programming a Horner OCS, therefore, if one wanted to use the port for an application, it would disable the port for programming. Thus, programming a method to turn off the port in logic, or taking the controller out of RUN mode was necessary. With USB and Ethernet as options for programming, this is less of a concern now, but the Logic still exists where a port needs to be opened.



3	(* When Serial Port Enabl Cscape communications a	le is pressed, the port are not allowed. In or	is opened. When Serial Port Enabled is False is p der to communicate with the OCS/RCS via Cscape	ressed, it is closed. When the port is open, , the port must be closed. *)
4	SerialPort_Enable	CLO	JSE	
1 5	×T00005	MJ1 – PO I	ат	
6				
7				
å	SerialPort_Enable	OPI	EN	Port_Open
2 9 10	2T00005 Port_Open	MJ1 - POI 9600 - Bau None - Par 8 - Dat 1 - Sto None - Har	ते Id ity a Bits p Bits ndshake	×T00004
11		Generic-Pro RS-232-Mo		

• Serial communication requires verification and management of the speed and format of the data across the wire. These parameters are found in the OPEN command block. For the Horner OCS to communicate with another device, their parameters need to match.

Open Comm Po	ort	×
C Settings Fro	m Registers Name:	8х <mark>16-віт</mark>
Port: MJ1	•	
Baud Rate:	9600 💌	
Parity:	None	
Data Bits:	8	
Stop Bits:	1	
Handshake:	None	
Protocol:	Generic	
Mode:	RS-232 💌	
	OK Cancel	

• Once the Port is Open, the controller is ready to either send or receive data. A barcode reader is the sender of the data and the Horner is the receiver.

12	(* In this "bar code" application, charact allowing characters to be placed in the R value of %R10. This variable can be set	ers are received from the bar code reader. Under normal operation, the Receive Block is enabled, eceive buffer of registers (%R101). The length of that Receive buffer is variable, and controlled by the from Screen #1, to any value from 0 to 20 characters. *)
13	RX_Reset	RECV
3		-PORT
14	Rx_Size %R00010	-Bytes
15		Rx_Count-%R00011

• The Horner OCS can display 20 Bytes of data at a time. ASCII code uses bytes, thus 20 characters of text and RX_Size %R10 in the sample the value needs to be set between 1 to 20, typically it is always set to 20.

The Data is stored in a Buffer at memory location, %R101, length 20 bytes, to %R110. Within the Horner, this data can be read in real time using the Watch tool.
P101 110 Type ASCU

File			
File) a subsequent rung. *)	
	Sel	lect an Element	
Memory V	/alue	Address: D101 110 Name	
		Name.	
	_	Type: ASCII	
		BOOLEAN BINARY	
		HEX Cancel	
		UDINT	
		ASCI	
		IP Address I DEAL ne RX Count has stopped changin	a .
		s been completed, and the RX_Cmplt bit (%T2) is	
Print	Add	Bunning	
	النبية معالم	a displayed as 2 sharesters per register is Dewermation1061	
	code uses	a decimal value in each byte to refer to a specific character.	
•	ASCII 12	8 http://www.asciitable.com/	
Watch - b —			
		Name	
mory Value	Type		
mory Value 00101 ''Po'' 00102 ''we''	Type ASCII ASCII	Bx_B Powermation1961	
mory Value 00101 "Po" 00102 "we" 00103 "m"	Type ASCII ASCII ASCII	Powermation1961	
mory Value 00101 ''Po'' 00102 ''we'' 00103 ''rm'' 00104 ''at'' 00105 ''io''	Type ASCII ASCII ASCII ASCII ASCII	Powermation1961	
mory Value 00101 "Po" 00102 "we" 00103 "rm" 00104 "at" 00105 "io" 00106 "n1"	Type ASCII ASCII ASCII ASCII ASCII ASCII ASCII	Powermation1961	
mory Value 00101 "Po" 00102 "we" 00103 "rm" 00104 "at" 00105 "io" 00106 "n1" 00106 "n1" 00107 "96" 00108 "1?"	Type ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII	Powermation1961	
mory Value 00101 "Po" 00102 "we" 00103 "rm" 00104 "at" 00105 "io" 00106 "n1" 00107 "96" 00108 "1?" 00109 "??"	Type ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII	Powermation1961	
mory Value 00101 ''Po'' 00102 ''we'' 00103 ''rm'' 00104 ''at'' 00105 ''io'' 00106 ''n1'' 00107 ''96'' 00108 ''1?'' 00108 ''1?'' 00109 ''??''	Type ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII	Powermation1961	
mory Value 00101 ''Po'' 00102 ''we'' 00103 ''rm'' 00104 ''at'' 00105 ''io'' 00106 ''n1'' 00106 ''n1'' 00108 ''1?'' 00108 ''??'' 00109 ''??'' 00110 ''??''	Type ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII	Powermation1961	
mory Value 00101 ''Po'' 00102 ''we'' 00103 ''rm'' 00104 ''at'' 00105 ''io'' 00106 ''n1'' 00107 ''96'' 00108 ''1?'' 00109 ''??'' 00110 ''??''	Type ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII	Powermation1961	
mory Value 00101 "Po" 00102 "we" 00103 "rm" 00104 "at" 00105 "io" 00106 "h1" 00107 "96" 00108 "1?" 00108 "1?" 00109 "??" 00110 "??"	Type ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII	Powermation1961	
mory Value 00101 ''Po'' 00102 ''we'' 00103 ''rm'' 00104 ''at'' 00105 ''io'' 00106 ''n1'' 00107 ''96'' 00108 ''1?'' 00109 ''??'' 00110 ''??''	Type ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII ASCII	Powermation1961	

 The Sample project Rungs 4 & 5 are written to check the RX Count variable to determine when the read is completed. If the Receive value is the same as it was before and not a 0, meaning clear buffer or -1 meaning closed port.

RX COUNT contains the number of bytes to be copied from the port's internal buffer to the registers at DATA (or -1 when the function is not active).

If the port is not opened the Receive Element does nothing, and power flow through the element is FALSE.

Power flow through the element is FALSE until the requested number of characters has been received from the comm port buffer (at which time the power flow will be TRUE). It is possible that the element can not transfer all data in one program scan time, especially at slower baud rates.

The BYTES can be a Register Type and Offset references. The maximum acceptable value is 255 bytes. When using a Register Type and Offset address, if the register contains a value less than 0 (zero) or greater than 255, the element does nothing, and power flow through the element is FALSE.

- 16 (* This rung checks to see that characters have been received, but RX_Count is not changing. This is an indication that the transmission by the bar code reader may be complete.
- The rung checks to see if RX_Count is non changing by comparing it with RX_Cnt_Pry (%R12). It checks RX_Count to see that it is non-zero, indicating characters have been received. It also checks that RX_Count is not -1, which indicates that the port is open.

If all these conditions are true, it sets the Timer_En (%T01) bit. This bit triggers a timer in a subsequent rung. *)

18	RX_Reset	EQ_INT		NE_INT		NE_INT	Timer_En
4	%T00003 %R11-	IN1	Rx_Cnt %B11-	IN1	Rx_Cnt %R11-	IN1	%T00001
19	Rx_Cnt_Prv						
	%R12+	IN2	0-	IN2	-1-	IN2	

20 (* This rung copies the current RX Count (%R11) to the Previous RX Count (%R12) register. This is only done if the current value (%R11) is different than the previous value (%R12). *)

21	RX_Reset	NE_INT		MOV		I I I			
5_	%T00003 %R11-	IN1	Rx_Cn %R000	word 11- IN	Bx-Cnt Prv				
22	Rx_Cnt_Prv %P10	1112			Q-%R00012				
	%ni2-	INZ							

 The sample project uses time as the trigger for the end of a read buffers. During testing the suggestion of 500 hundredths of a second as the timer preset. During runtime of the application, the suggestion is 25 hundredths of a second.

23 (* This is the Receive Timer. It is started after characters have been received in the Receive Block, and the RX Count has stopped changing. After this 250mS timer expires, it is assumed the transmission by the Bar Code Reader has been completed, and the RX_Cmplt bit (%T2) is energized. *)

24 Ø-	Timer_En	 Rx_Timer	TON	%R00001	 	Rx_Cmplt	 	 	 	
6_	%T00001		0.01s			%T00002				
25		RX_Timer_Preset %R00003-	PT							

• Once the timer completes, the data from the buffer is moved to a static memory location %R201-210, which can be used to be the recipe pointer or be used to decipher application process parameters.

(* When the Receive is complete, this rung copies the received characters to another register buffer (at %R201-210), and clears the receive buffer (%R101-110). The RX_Reset bit is then energized, which removes power from the Receive Block for one scan. *)

27	Rx_Cmplt	BMV		F	-ill		RX_Reset	 	 	 	
728	Rx_Buf %T00002%R00101-	Word IN	Rx_Disp ≪⊡00001		vord N	Rx_Buł ∾⊡00101	%T00003				, , , , ,
	10-	N	-%600201	10-1	4 1	-%h00101					

Barcode Configuration

- The sample project utilizes a DATALOGIC barcode reader with wireless remote base.
 - For 1D only Kit Part Number: PM9100-910RBK20
 - For 2D/1D Kit Part Number: PM9501-HP910RBK20
- The barcode reader itself is configured by scanning specifically coded barcodes. Below will be the codes required to get a scanner configured to communicate with the Horner's sample code.
 - \circ $\;$ This information is found on DATALOGIC's website in the product manual.
 - PowerScan 9100
 - <u>Powerscan 9100 family prg_eng</u>
 - Quick Reference PowerScan PD9130
 - \circ $\;$ Link the cradle and the reader. If this was done before, skip this step.
 - Scan Unlink



Unlink

- Place reader in cradle for 5 seconds.
 - This links the wireless reader to the wireless cradle base.
- Select Standard RS232 as Interface Type.



 \circ $\;$ Set Factory Default Settings for the RS232 parameters.



Sample Barcodes

- The Default Code in the DATALOGIC Barcode Reader is ASCII 128.
 - \circ ~ Generate Some Sample Codes Here



Bill Of Materials

LN#	Item Code	Item Description	Quantity
1	HE-XW1E2	HORNER APG LLC XL7 Series OCS w/ DC/Relay I/O. 12 Digital Inputs compatible w/ 12V/24VDC - four (4) inputs can be used for two 500kHz High Speed Counters. Six (6) Relay Outputs - up to 5A continuous current. Four (4) 12-bit Analog Inputs selectable between 0-10V and 4-2	1.00

2	PM9100-910RBK20	DATALOGIC USA, INC.	1.00
		Datalogic PowerScan PM9100 - RS-232 Serial Kit, Barcode	
		scanner, Datalogic PowerScan PM9100, 910 MHz,	
		Cordless, Kit Includes Scanner (PM9100-910RB),	
		Communication Base (BC9030-910), RS-232 Interface Cable	
		(CAB-433), and Power supply (6003-0941 & 8-0935).	

3	HE500CBL300	HORNER APG LLC	1.00
		PROGRAMMING CABLE FOR COLOR-TOUCH OCS	

4	2708753	PHOENIX CONTACT INC	1.00
		PSM-AD-D9-NULLMODEM V.24 (RS-232) zero modem	
		connector	

5	1652651	PHOENIX CONTACT INC	1.00
		VS-09-GC-ST/ST D-SUB contact insert shell size 1 with	
		nine signal contacts contact type pin gender changer fixing	
		with 4-40 UNC thread	