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Linking RFID to PLCs to Automate Manufacturing

Kevin Berisso, Ph.D.

University of Memphis

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The Hidden Cost of a Product Recall

27 FEB 2019 | by Danielle Kost

Product failures create managerial challenges for companies but market opportunities for competitors, says **Ariel Dora Stern**. The stakes have only grown higher.

0

Drivers on Interstate 25 in Colorado have been speculating about the fate of hundreds Volkswagen cars sitting in a lot near Pikes Peak International Raceway. It's one of in the United States where the automaker is storing 300,000 diesel cars it admitting to cheating American emissions tests.

Volkswagen estimated that fines, repairs, and legal costs would total more than $30 billion. And worse, the company ceded its command of America's diesel car market—producing more than one-third (pdf) of the models available in 2015—to companies such as General Motors, Ford and Mazda, which expanded their diesel lineups (pdf).

Large recalls are the ultimate nightmare for senior executives at companies with considerable research and development (R&D) operations. Beyond the staggering remediation and legal expenses that recalling companies incur, there are also costs to rework manufacturing processes and stem reputational damage. In one of the costliest recalls in history, Johnson & Johnson spent more than $100 million in 1982 (more than $260 million in today's dollars) to recall 31 million bottles of Tylenol capsules and re-establish the brand.

"PRODUCT RECALLS SLOW MANY TYPES OF INNOVATION

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Volkswagen:
"more than $30 billion"

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The Hidden C

27 FEB 2019 | by Danielle Kost

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higher.

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Volkswagen cars sitting in a lot near Pik

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establish the brand.

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some point, and the costs of such an event cannot always be measured in dollars and cents.

On average, a food recall causes direct costs to the manufacturer upwards of $10 million. This is a huge number for any business, but it can be devastating to mid-sized or smaller companies that can struggle to survive through that lost revenue. Along with having current product pulled from shelves at a loss, depending p the recall issue runs into the supply chain, the processor may also face having possibly defective product or raw materials in storage.

ings that can be lost in a recall that are just as devastating, and often, harder to ole consumer trust: over half of consumers report that they cease er it has been recalled, and studies have shown that a brand's stock 2% following a recall. Trust is one of the hardest things to rebuild, s gone, impacting sales far into the future. On top of this, many of tandards for their suppliers, and if a recall happens and the k having their contract terminated. Once the effects of these losses n can seem like a drop in the bucket.

these risks? The most crucial step is to ensure that you have a n in place. Digitizing these processes is essential, as tracking on t, but also introduces numerous chances for error into the process. act to problems quickly, with accurate data, suffer far fewer losses than those who cannot.

Ready to automate your lot tracing and recall management? ParityFactory can help! Reach out t today and we'll show you how our system can help take the fear out of recalls.

Average food recall upwards of $10 million

Ford:
6.5 million vehicles

Merck:
Vioxx – $4.85 billion

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sibly defective

paper is not only slow and inefficient, but a
Processors who can identify and react to pr
than those who cannot.

Ready to automate your lot tracing and rec
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investopedia.com/articles/investing/010815/how-do-recalls-affect-company.asp

Investopedia

Ford (F) issued a recall of 6.5 million vehicles with Firestone tires in the early 2000s. [14]
ective tires resulted in 5,000 complaints, 800 injures, and 271 deaths in
U.S. [15] [16] Toyota has issued a number of massive recalls beginning in 2009, ultimately recalling over 10 million vehicles due to numerous issues including sticky gas pedals and faulty airbags. [17] [18]

The drug industry has also suffered from devastating recalls. Drug manufacturer Merck (MRK) recalled its arthritis medication Vioxx, because of the increased risk it posed of heart attacks. [19] The drug cost Merck $4.85 billion in
claims and lawsuits. [20]

Coffee machine manufacturer Keurig recalled 7.2 million single-service brewing machines due to claims of overheating. [11] Regardless of the industry in which the recall occurs, it is evident that large companies are able to withstand both financial and reputation costs.

The Bottom Line

The effects of a product recall may be detrimental in the short run, but there is no evidence to support long-lasting decreases in sales or stock prices. Toyota and Merck experienced brief financial consequences as a result of product recalls, but were able to rebound, with their brands and stock prices showing a strong recovery.

With the supervision of government agencies, product recalls seem to have become almost weekly occurrences. This may be attributed to the increasing complexity of the global supply chain. To cut costs and remain competitive, modern merchandise incorporates manufactured parts from around the world, sometimes at the cost of reliability.

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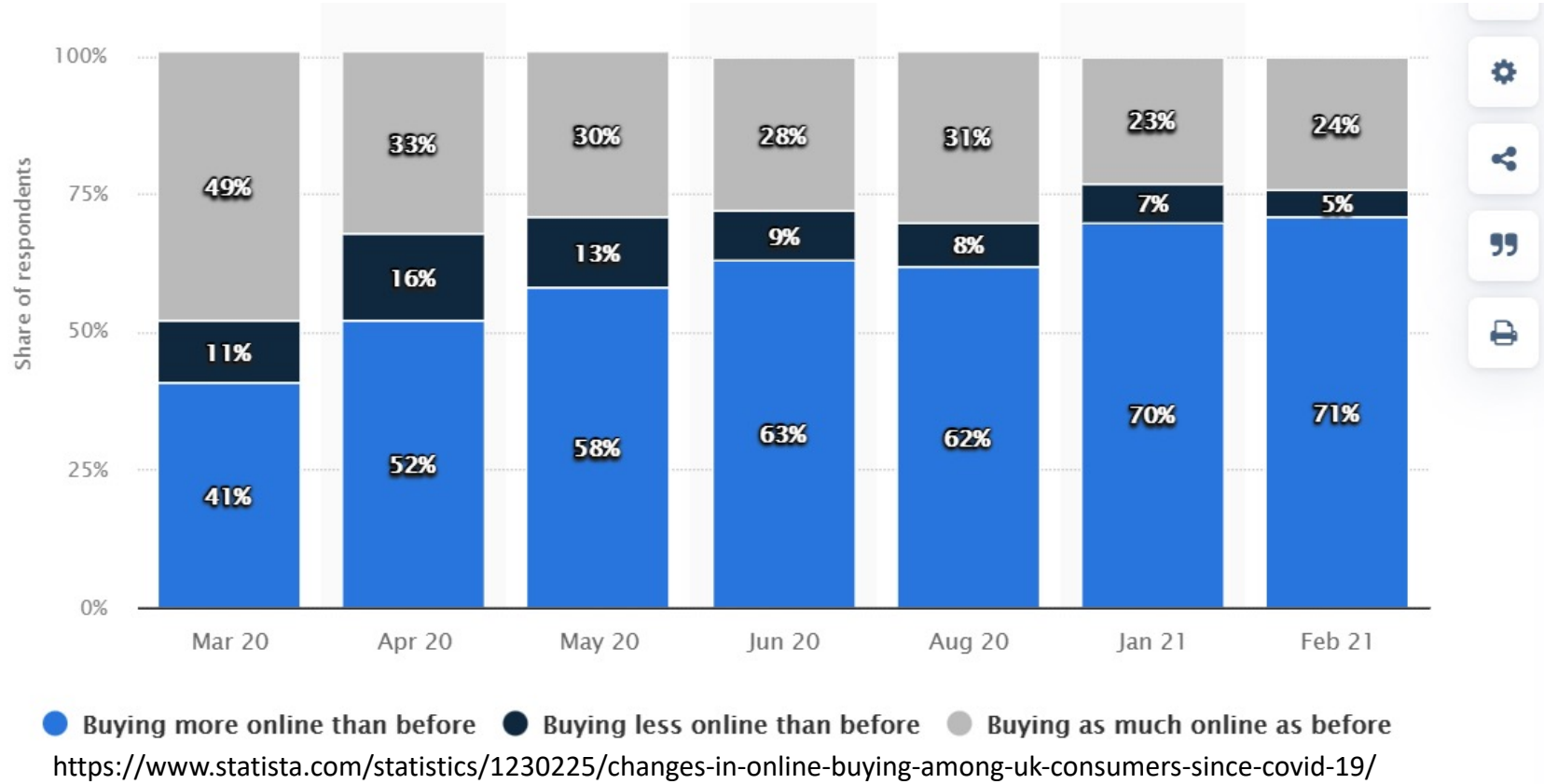
Percentage change in online purchases due to the coronavirus (COVID-19) pandemic in the United Kingdom from March 2020 to February 2021



https://www.statista.com/statistics/1230225/changes-in-online-buying-among-uk-consumers-since-covid-19/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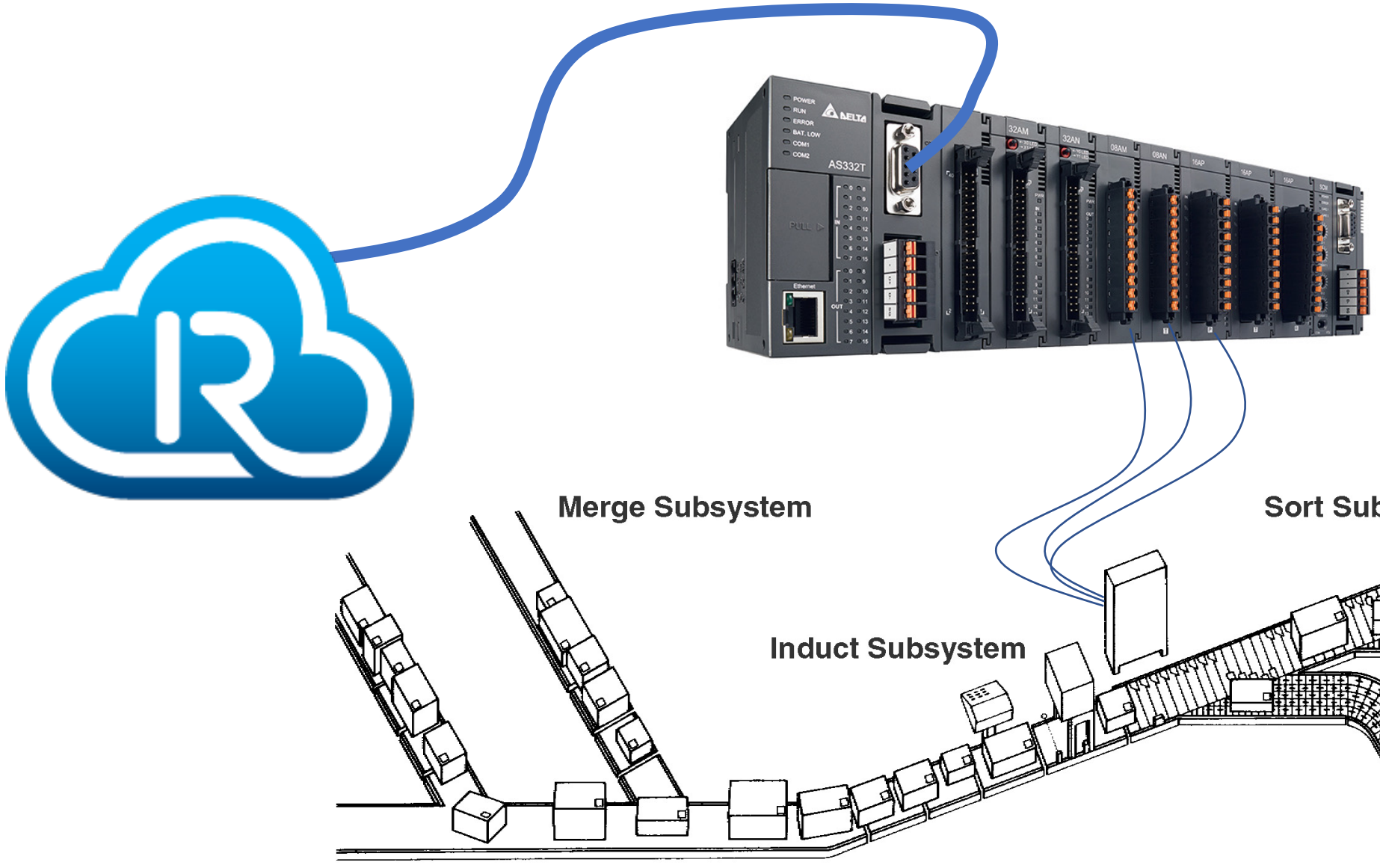

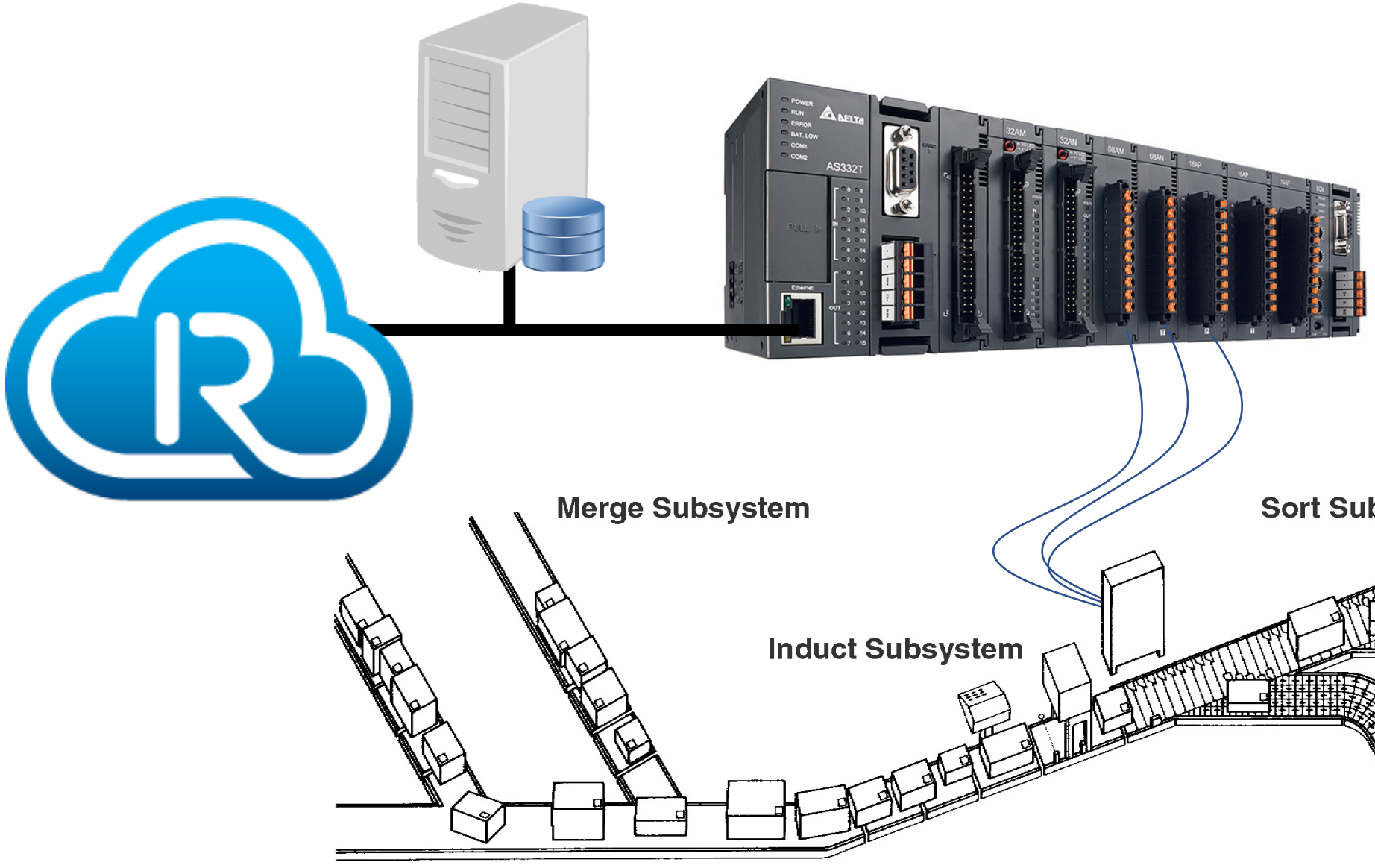

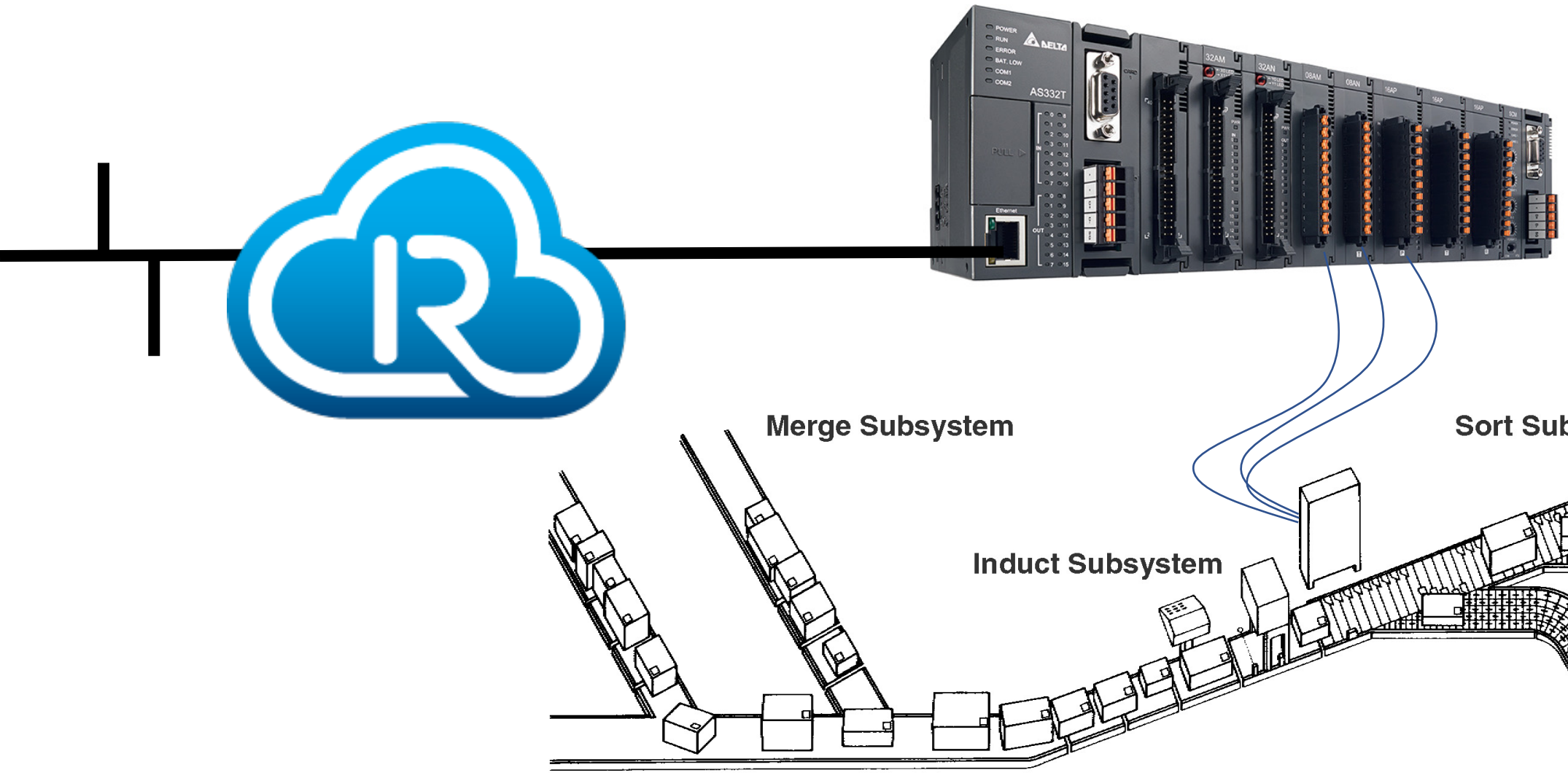

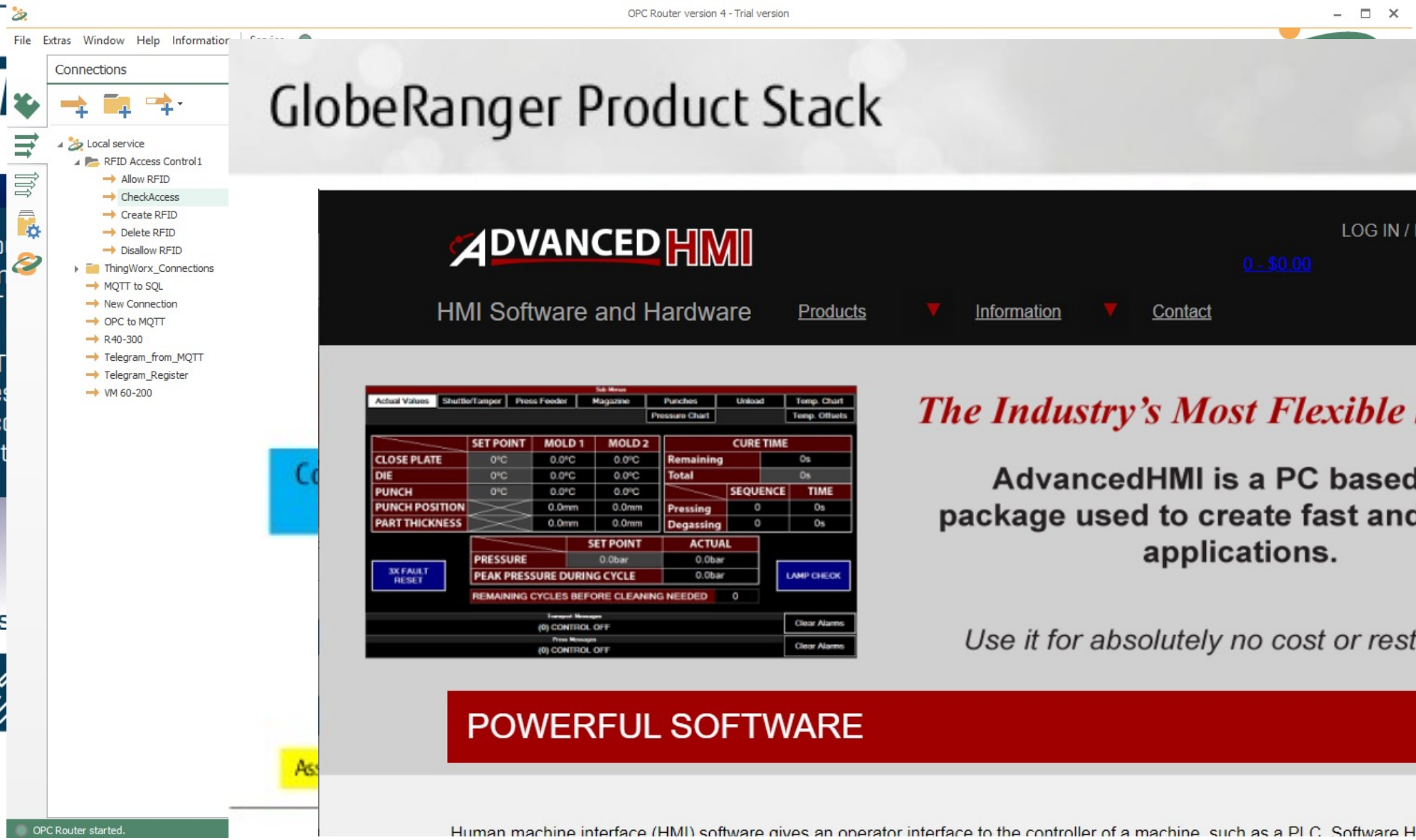

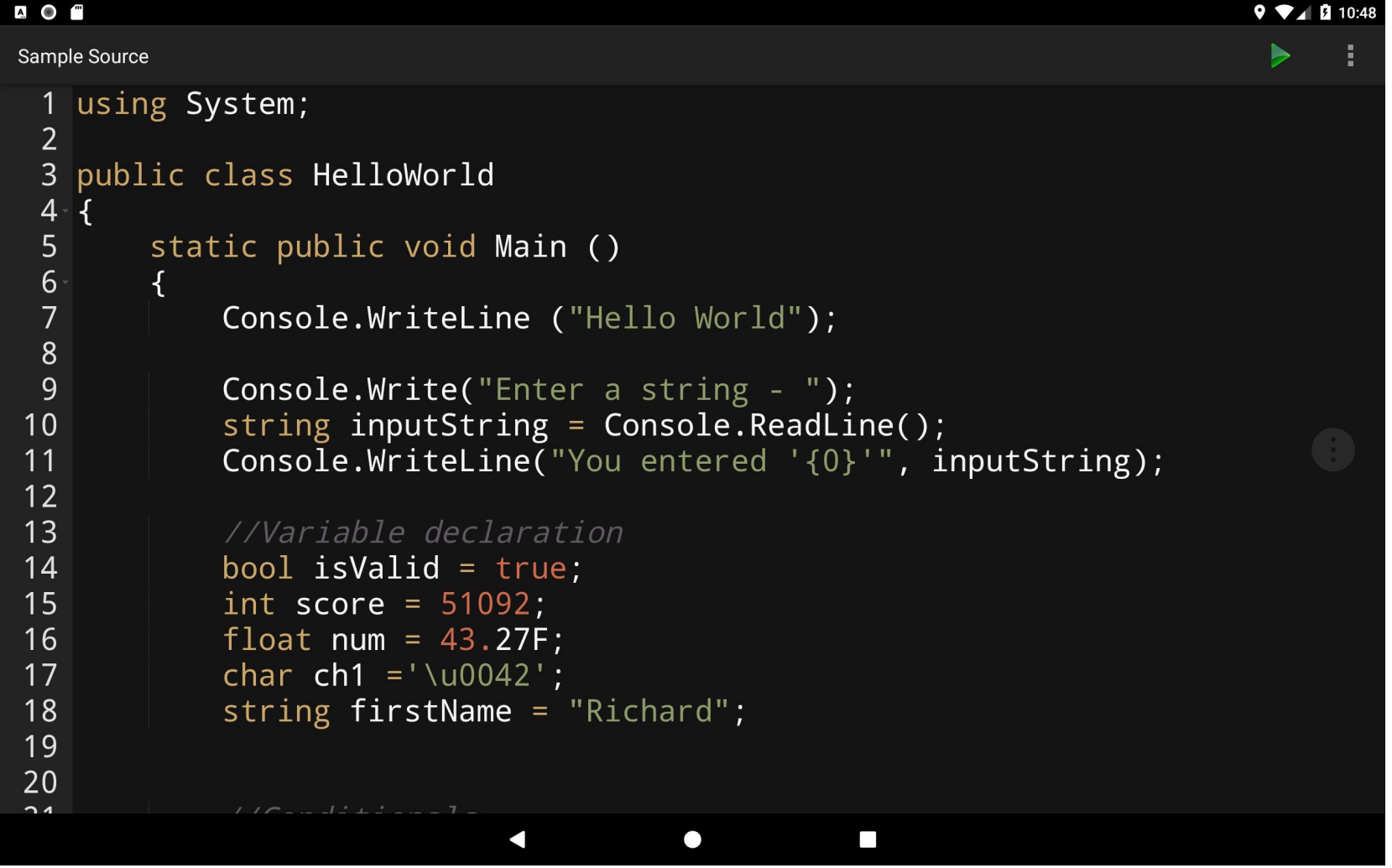

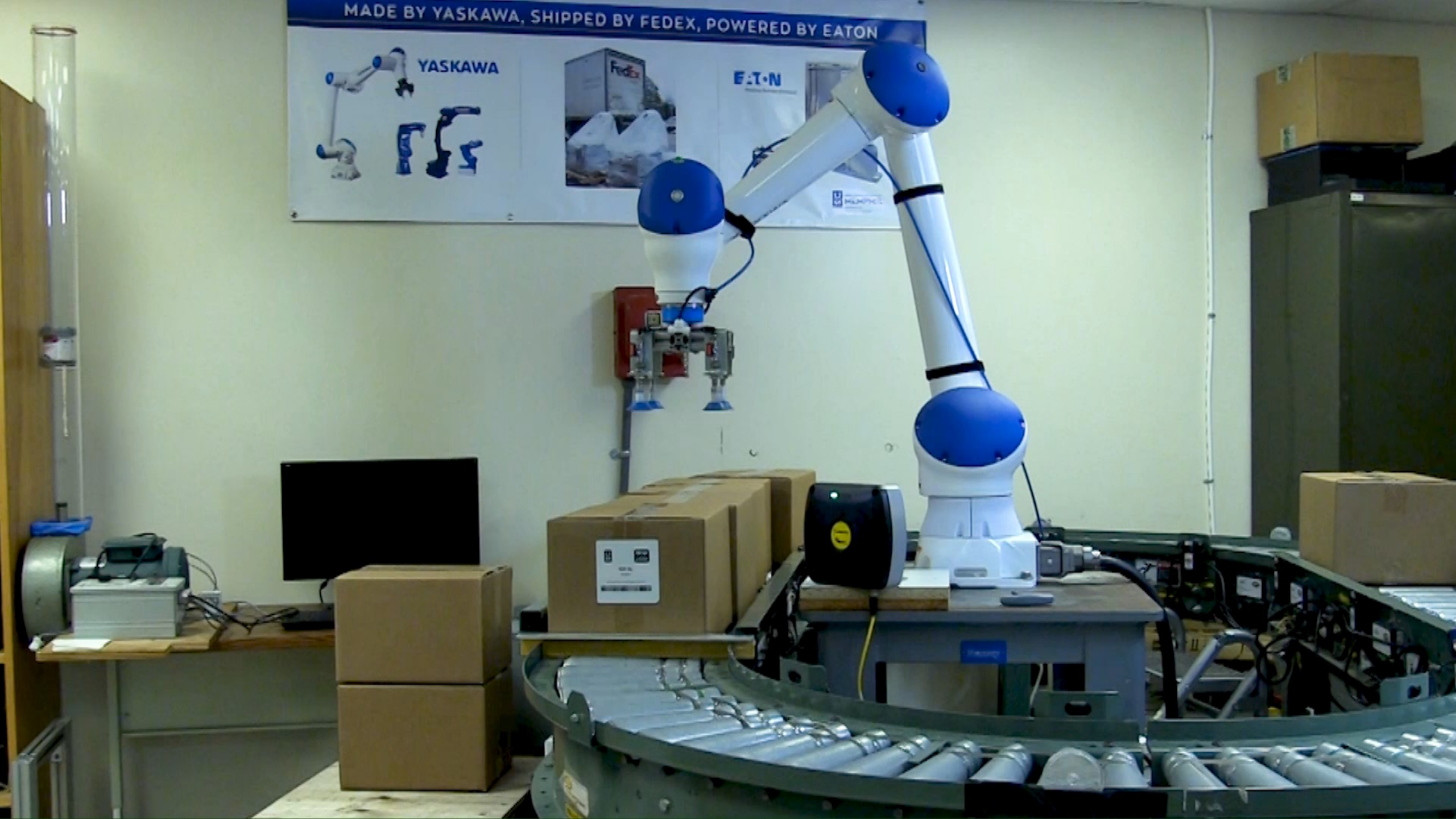
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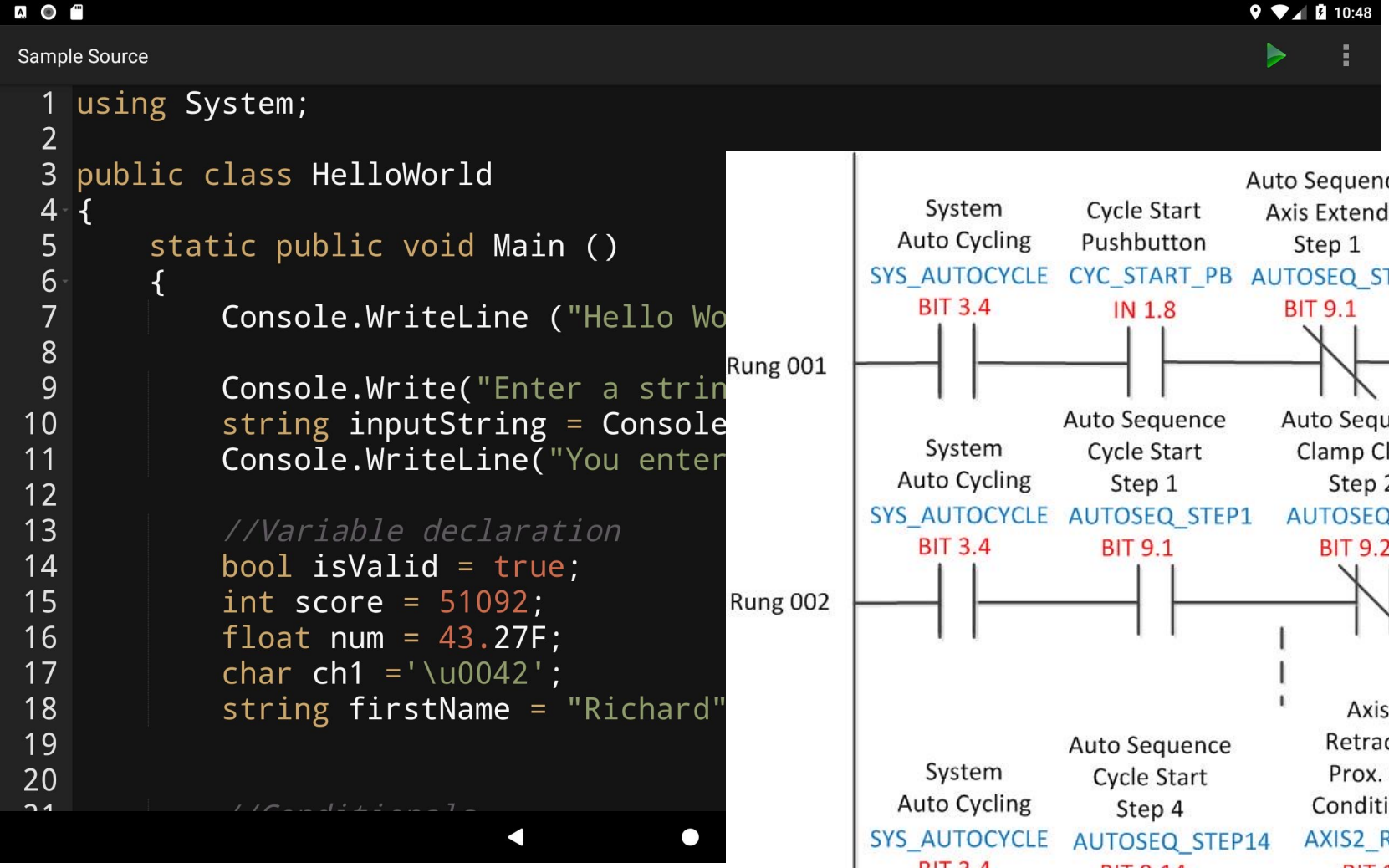

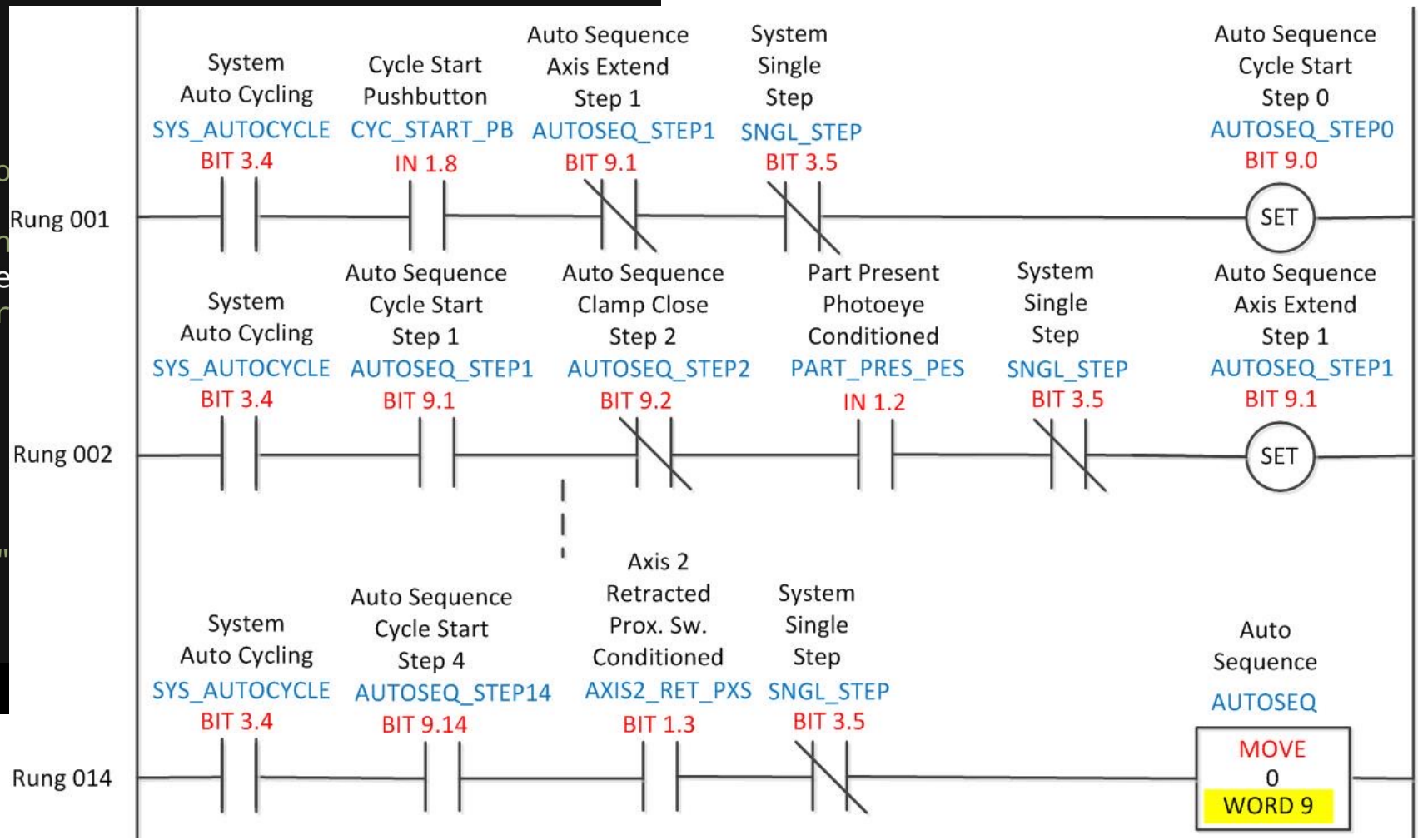

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- Commit/Discard
- System Log
- Diagnostics
- Shutdown
- Logout

User Application Page

Existing Packages:

List of Installed apps	Start/Stop	AutoStart	Uninstall
RFIDSample4App			Uninstall

Meta Data

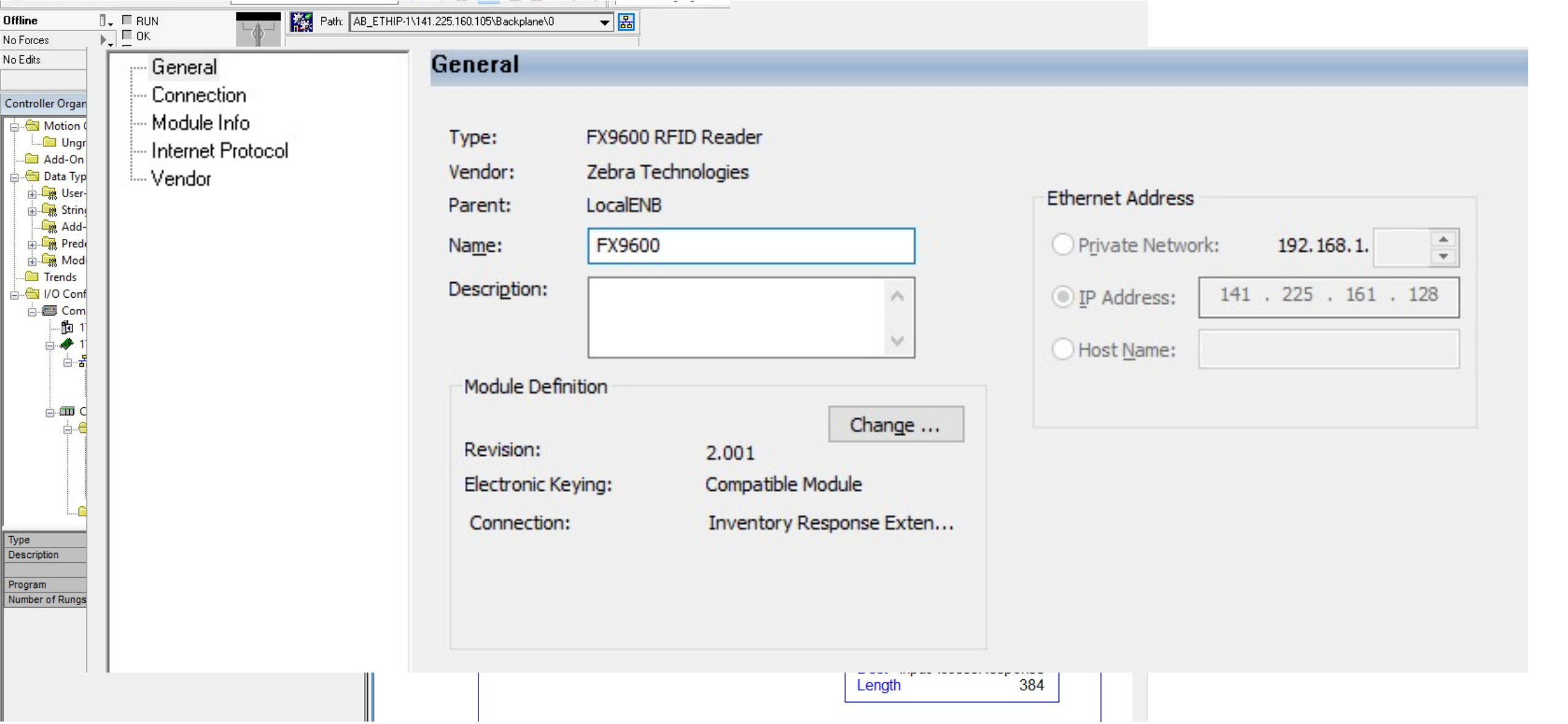
Package Name:RFIDSample4App
Package Version: 1.0
Status: install user installed
architecture: all

Install New Package:

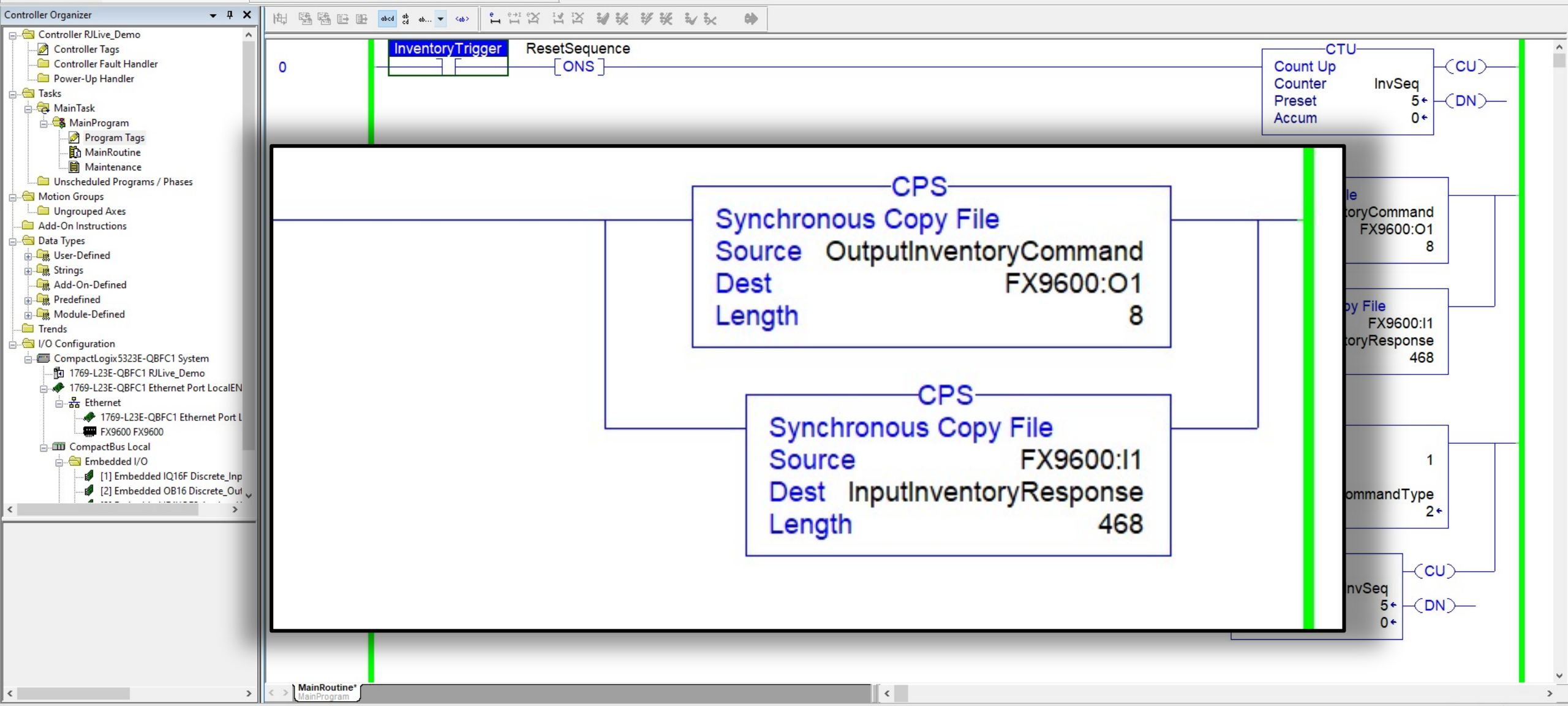
Current Status: Select package from the browser button

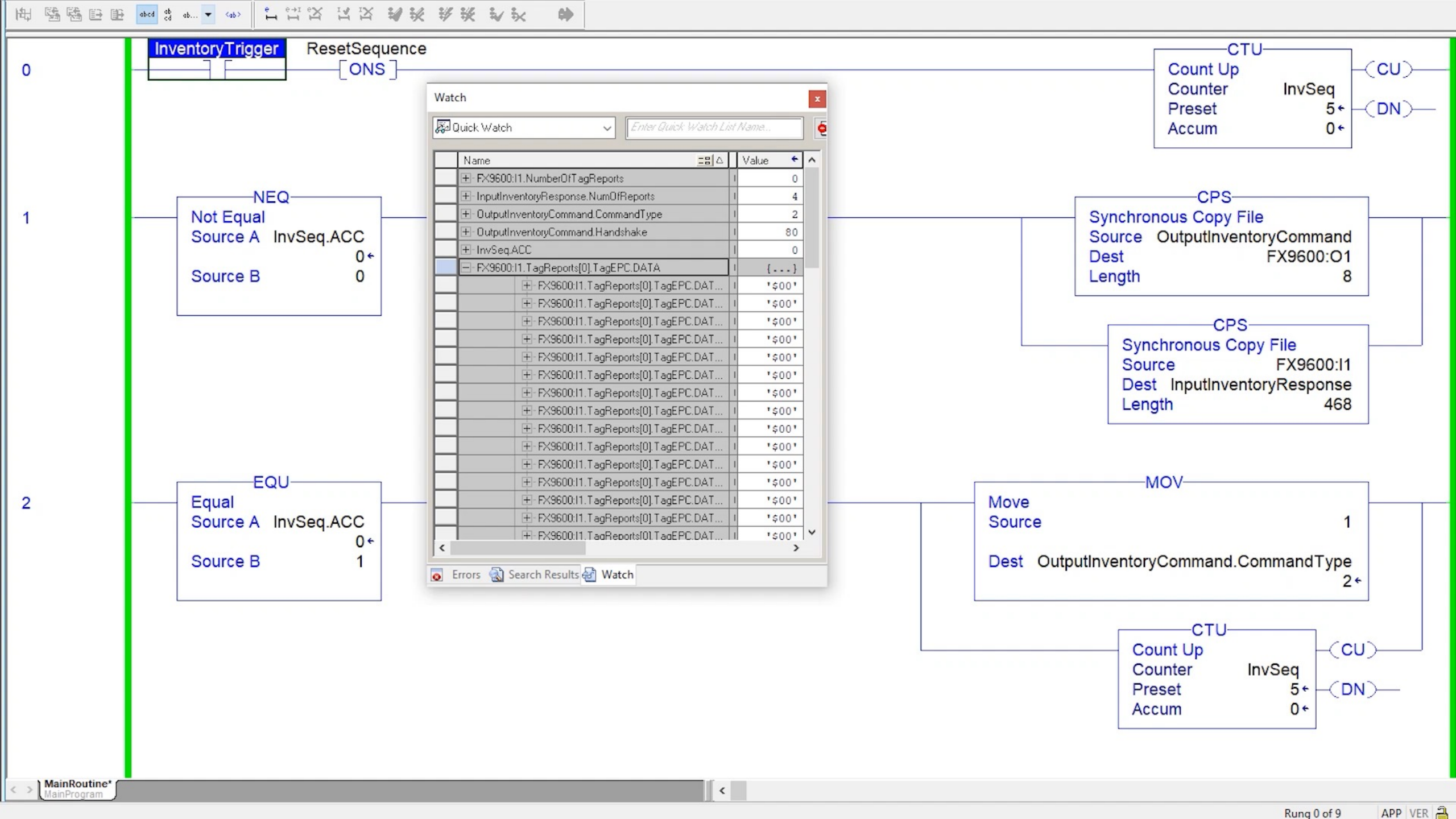
package: Browser

Install



FX9600:I1	{...}	{...}	
FX9600:I1.ConnectionFaulted	0		Decimal
FX9600:I1.StatusMask	{...}	{...}	
FX9600:I1.PacketSequenceNumber	119		Decimal
FX9600:I1.NumberOfTagReports	0		Decimal
FX9600:I1.TagReports	{...}	{...}	
FX9600:I1.TagReports[0]	{...}	{...}	
FX9600:I1.TagReports[0].TagEPC	{...}	{...}	
FX9600:I1.TagReports[0].TagPC	0		Decimal
FX9600:I1.TagReports[0].TagCRC	0		Decimal
FX9600:I1.TagReports[0].AntennaID	0		Decimal
FX9600:I1.TagReports[0].RSSI	0		Decimal
FX9600:I1.TagReports[0].ChannelIndex	0		Decimal
FX9600:I1.TagReports[0].SeenCount	0		Decimal
FX9600:I1.TagReports[0].PhaseInfo	0		Decimal
FX9600:I1.TagReports[0].FirstSeenTimeStamp	{...}	{...}	
FX9600:I1.TagReports[0].LastSeenTimeStamp	{...}	{...}	
FX9600:I1.TagReports[0].AccessStatus	0		Decimal

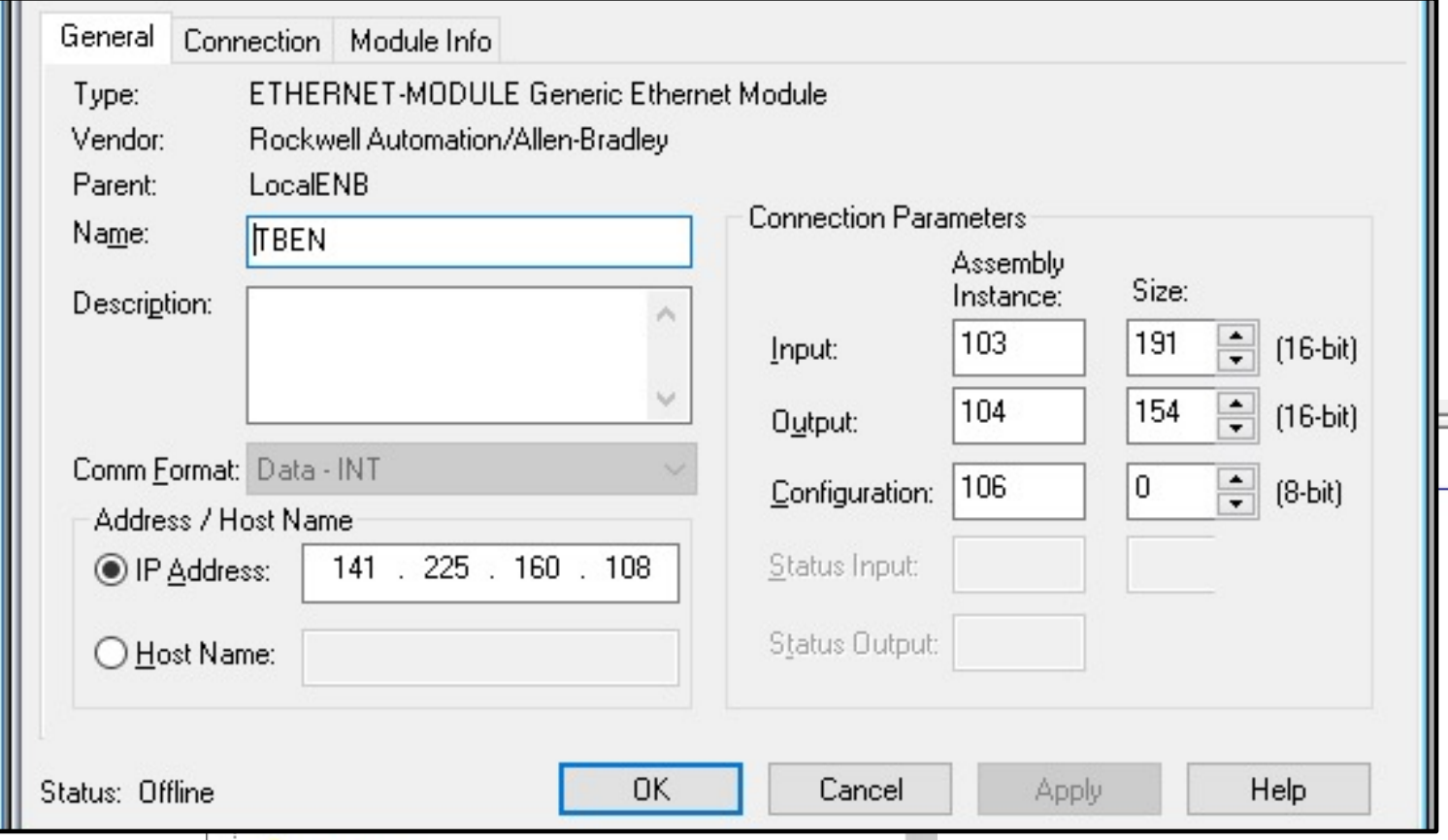


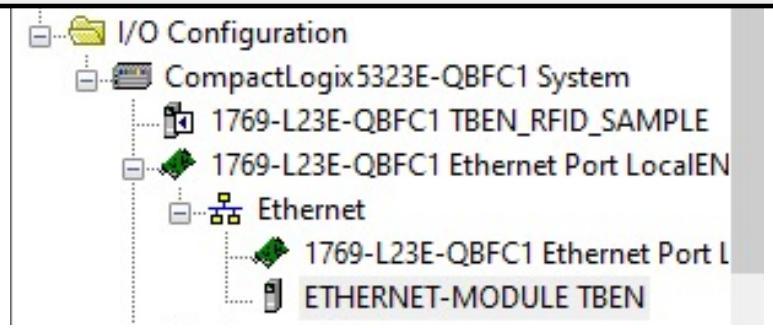

InventoryTrigger
ResetSequence
ONS
0
CTU
Count Up
Counter InvSeq
Preset 5
Accum 0
CU
DN
1
NEQ
Not Equal
Source A InvSeq.ACC
0
Source B 0
CPS
Synchronous Copy File
Source OutputInventoryCommand
Dest FX9600:O1
Length 8
CPS
Synchronous Copy File
Source FX9600:I1
Dest InputInventoryResponse
Length 468
2
EQU
Equal
Source A InvSeq.ACC
0
Source B 1
MOV
Move
Source 1
Dest OutputInventoryCommand.CommandType
2
CTU
Count Up
Counter InvSeq
Preset 5
Accum 0
CU
DN
Watch
Quick Watch
Enter Quick Watch List Name...
Name
Value
FX9600:I1.NumberOfTagReports 0
InputInventoryResponse.NumOfReports 4
OutputInventoryCommand.CommandType 2
OutputInventoryCommand.Handshake 80
InvSeq.ACC 0
FX9600:I1.TagReports[0].TagEPC.DATA {...}
FX9600:I1.TagReports[0].TagEPC.DAT... '$00'
Errors
Search Results
Watch
MainRoutine*
MainProgram
Rung 0 of 9
APP
VER

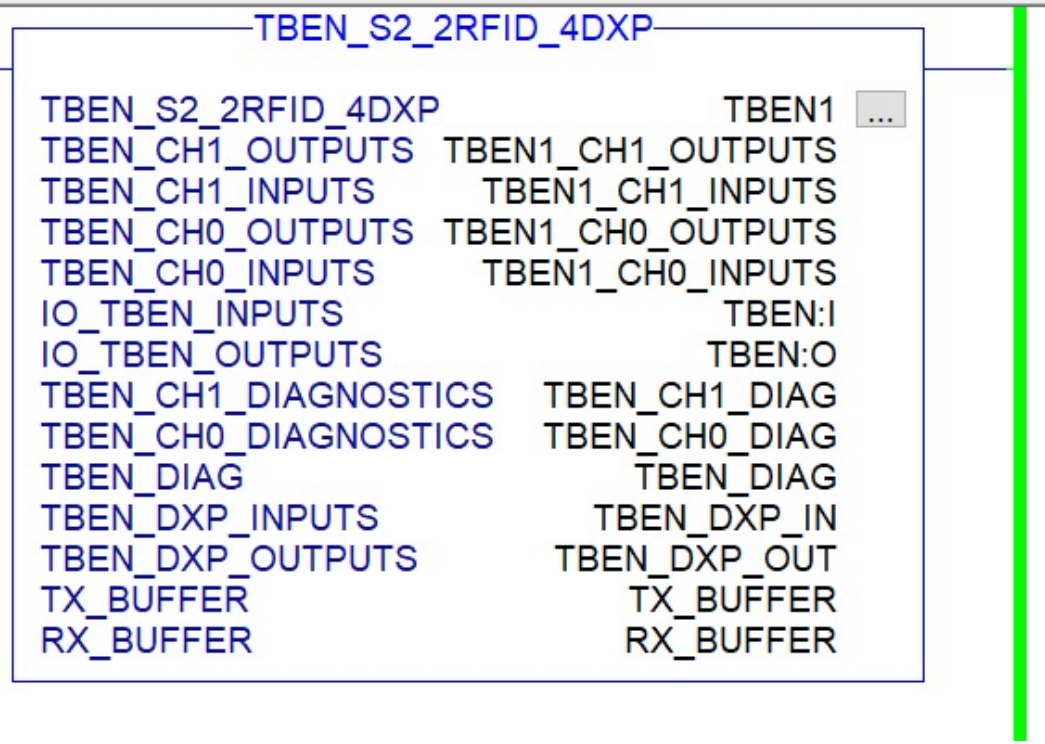
TURCK

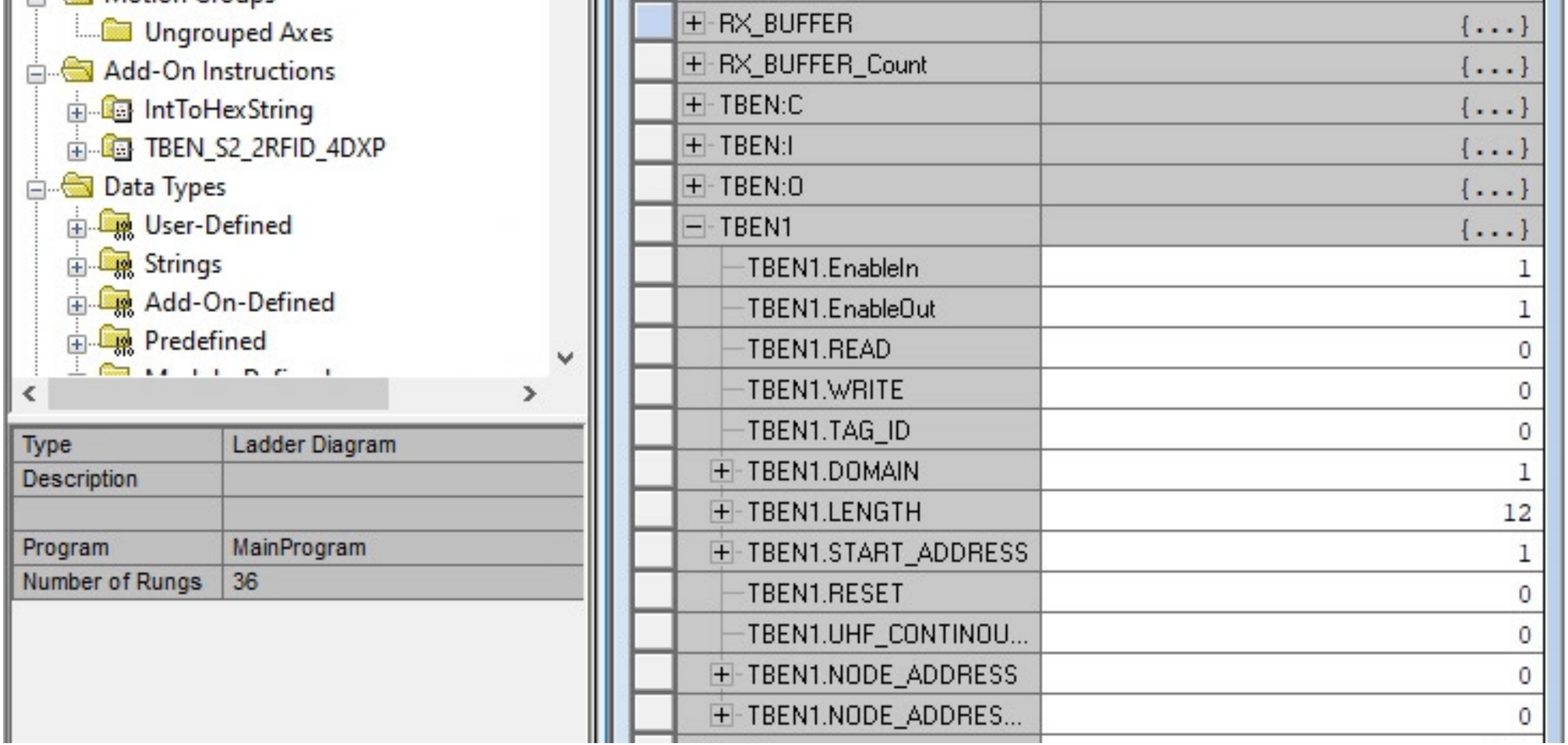
TBEN1	{...}
TBEN1.EnableIn	1
TBEN1.EnableOut	1
TBEN1.READ	0
TBEN1.WRITE	0
TBEN1.TAG_ID	0
+ TBEN1.DOMAIN	1
+ TBEN1.LENGTH	12
+ TBEN1.START_ADDRESS	1
TBEN1.RESET	0
TBEN1.UHF_CONTINOUS_MODE	0
+ TBEN1.NODE_ADDRESS	0
+ TBEN1.NODE_ADDRESS_TP	0
trigger	0

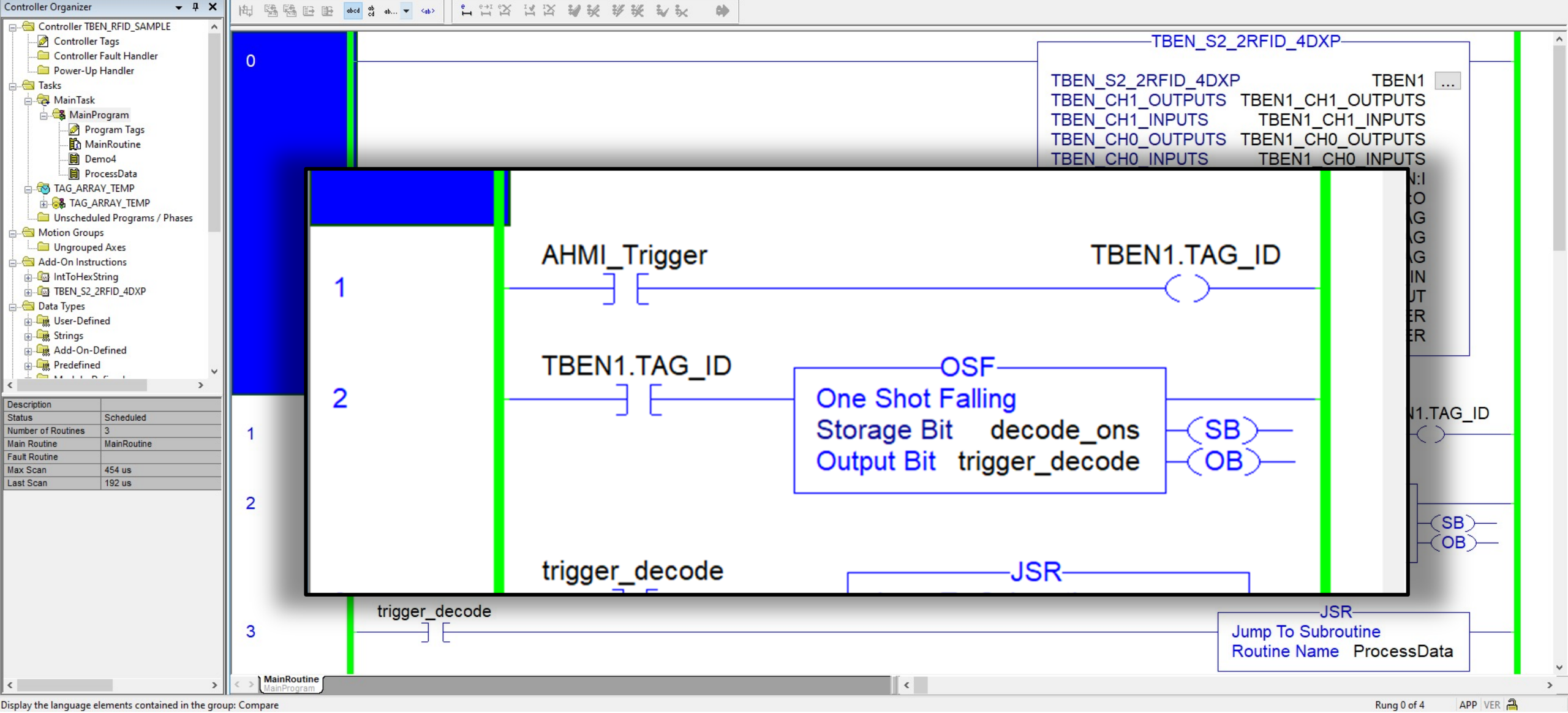
Name	Value
− RX_BUFFER	{...}
+ RX_BUFFER[0]	24
+ RX_BUFFER[1]	1
+ RX_BUFFER[2]	-30
UFFER[3]	0
UFFER[4]	-112
UFFER[5]	55
UFFER[6]	-119
UFFER[7]	2
UFFER[8]	2
UFFER[9]	24
UFFER[10]	8
UFFER[11]	0
UFFER[12]	-58
UFFER[13]	-14
UFFER[14]	24
UFFER[15]	-2
UFFER[16]	3
UFFER[17]	0
UFFER[18]	-45
UFFER[19]	-17











Controller Organizer

- TAG_ARRAY_TEMP
- Unscheduled Programs / Phases
- Motion Groups
  - Ungrouped Axes
- Add-On Instructions
  - IntToHexString
  - TBEN_S2_2RFID_4DXP
- Data Types
  - User-Defined
  - Strings
  - Add-On-Defined
  - Predefined
  - Module-Defined
- Trends
- I/O Configuration
  - CompactLogix5323E-QBFC1 System
    - 1769-L23E-QBFC1 TBEN_RFID_SAMPL
    - 1769-L23E-QBFC1 Ethernet Port Local
      - Ethernet
        - 1769-L23E-QBFC1 Ethernet Por
        - ETHERNET-MODULE TBEN
    - CompactBus Local
      - Embedded I/O
        - [1] Embedded IQ16F Discrete_I

Module Defined Tags

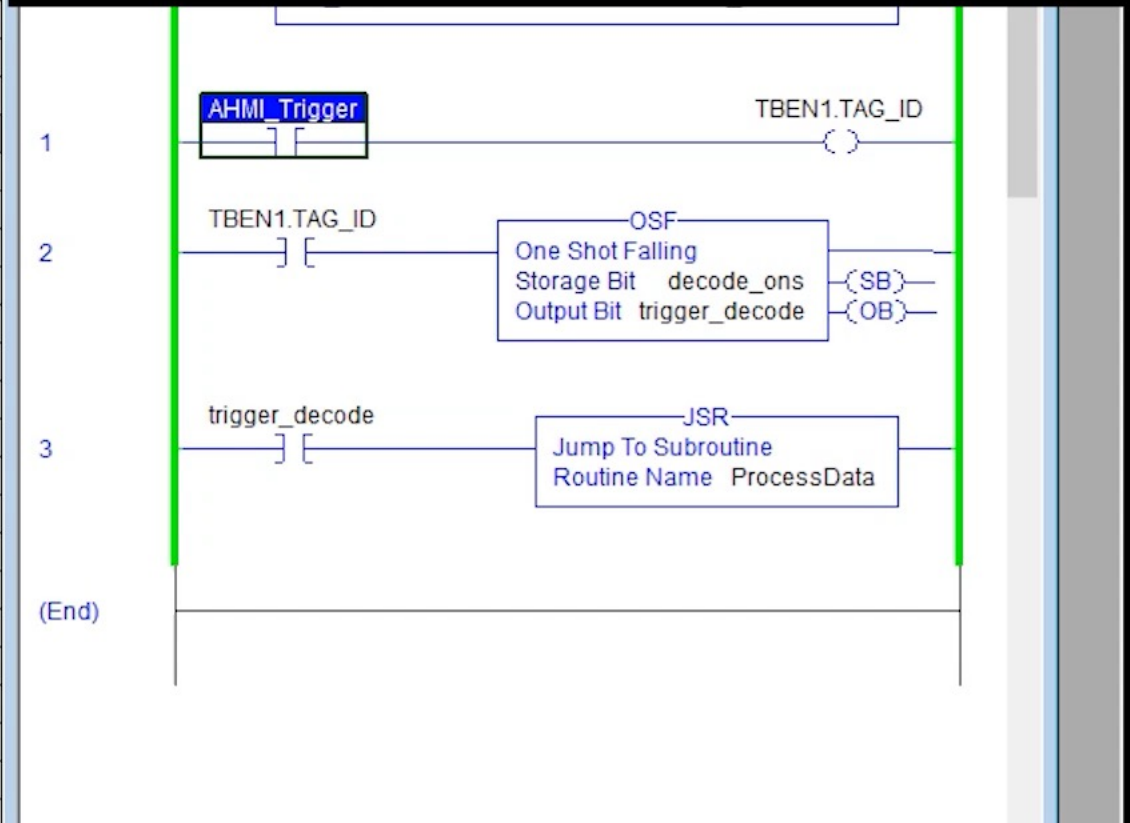
- TBEN:I
- TBEN:O
- TBEN:C

Description	
Status	Running
Module Fault	

Controller Tags - TBEN_RFID_SAMPLE(controller)

Scope: TBEN_RFID_SA Show: All Tags Enter Nan

Name	Value
Local:2:I	{...}
Local:2:O	{...}
Local:3:C	{...}
Local:3:I	{...}
Local:3:O	{...}
Local:4:C	{...}
Local:4:I	{...}
Local:4:O	{...}
myConversion	{...}
myIndex	0
mystring2	'226'
PETrigger	0
PETriggerFallingEdge	0
ProcessDataBit	0
reset_ons	0
RX_BUFFER	{...}
RX_BUFFER[0]	14
RX_BUFFER[1]	1
RX_BUFFER[2]	-30
RX_BUFFER[3]	0
RX_BUFFER[4]	52
RX_BUFFER[5]	18
RX_BUFFER[6]	-36
RX_BUFFER[7]	3
RX_BUFFER[8]	1
RX_BUFFER[9]	24
RX_BUFFER[10]	40
RX_BUFFER[11]	5
RX_BUFFER[12]	-110
RX_BUFFER[13]	117
RX_BUFFER[14]	1
RX_BUFFER[15]	0
RX_BUFFER[16]	0



Monday, September 27, 4:20 PM - 5:00 PM

Improving Visibility and Traceability in the Retail Grocery and Foodservice Industries: Encoding Attribute Data in EPC/RFID Tags

Room: N221 B

RFID technology offers many benefits relating to traceability and operational efficiencies for the retail grocery and foodservice industry. Effectively tracking food products at the carton and case-level helps ensure food safety, recall readiness, and supply chain visibility. Electronic Product Code/Radio Frequency Identification (EPC/RFID) technology does more than just encode the... ...read more...

Speaker(s)

Jonathan Gregory

Director of Community Engagement, Apparel and General Merchandise

GS1 US

As the Director of Community Engagement of Apparel and General Merchandise at GS1 US, Jonathan Gregory facilitates collaboration among brands, retailers, and their supply chain partners to optimize the use of GS1

Figure 6.2-1 The list of possible options

Option	1st element	2nd element	3rd element	4th element
1	Date	Batch/Lot	Sequence	
2		Net Weight	Batch/Lot	Sequence

https://www.gs1us.org/industries/foodservice/implementation-resources/encoding-attribute-data-in-epc-rfid

Figure 6-1, Example showing attribute data packed into serialization block (Option 1 from Figure 6.2-1)

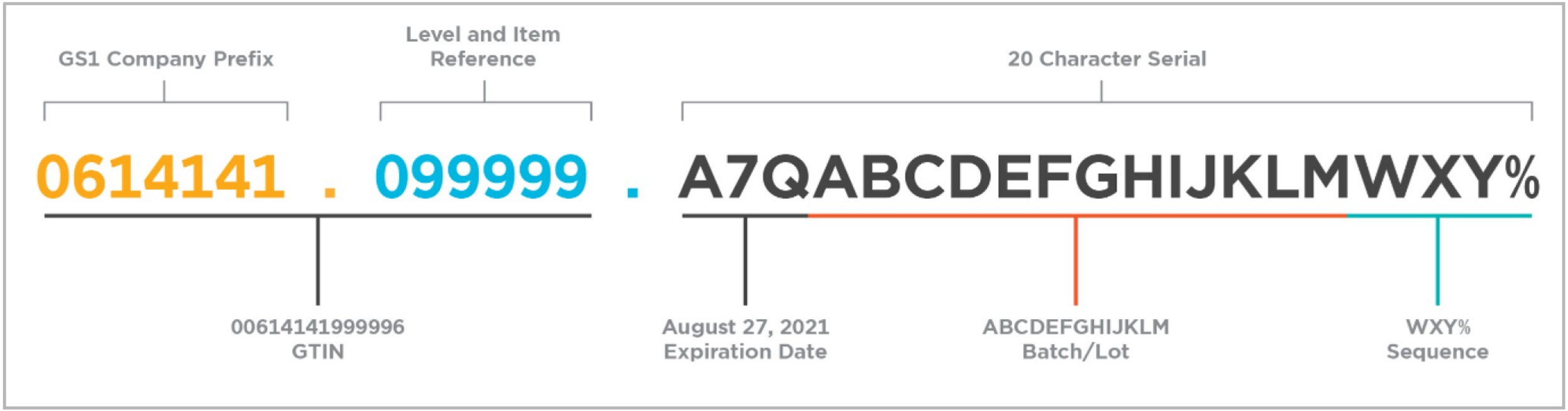



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Table 14-4 SGTIN-198 coding table

Scheme	SGTIN-198					
URI Template	urn:epc:tag:sgtin-198:*F.C.I.S*					
Total Bits	198					
Logical Segment	EPC Header	Filter	Partition	GS1 Company Prefix (*)	Indicator (**) / Item Reference	Serial
Logical Segment Bit Count	8	3	3	20-40	24-4	140
Coding Segment	EPC Header	Filter	GTIN			Serial
URI portion		*F*	*C.I*			*S*
Coding Segment Bit Count	8	3	47			140
Bit Position	$b_{197}b_{196}...b_{190}$	$b_{189}b_{188}b_{187}$	$b_{186}b_{185}...b_{140}$			$b_{139}b_{138}...b_0$
Coding Method	00110110	Integer	Partition *Table 14-2*			String

Figure 6.3-4 The format of Date

Name	Hex Value	URI Form	1st Date Char: YY	2nd Date Char: MM+Date Option	3rd Date Char: DD+What Follows
Digit Zero	30	0	N/A	01 - January + Expiration Date	01 + Batch/Lot Follows
Digit One	31	1	N/A	02 - February + Expiration Date	02 + Batch/Lot Follows
Digit Two	32	2	N/A	03 - March + Expiration Date	03 + Batch/Lot Follows
Digit Three	33	3	N/A	04 - April + Expiration date	04 + Batch/Lot Follows
Digit Four	34	4	N/A	05 - May + Expiration date	05 + Batch/Lot Follows
Digit Five	35	5	N/A	06 - June + Expiration date	06 + Batch/Lot Follows
Digit Six	36	6	N/A	07 - July + Expiration date	07 + Batch/Lot Follows
Digit Seven	37	7	N/A	08 - August + Expiration date	08 + Batch/Lot Follows
Digit Eight	38	8	N/A	09 - September + Expiration date	09 + Batch/Lot Follows
Digit Nine	39	9	N/A	10 - October + Expiration date	10 + Batch/Lot Follows
				11 - November + Expiration	

Parse out first 3 serial number "characters"

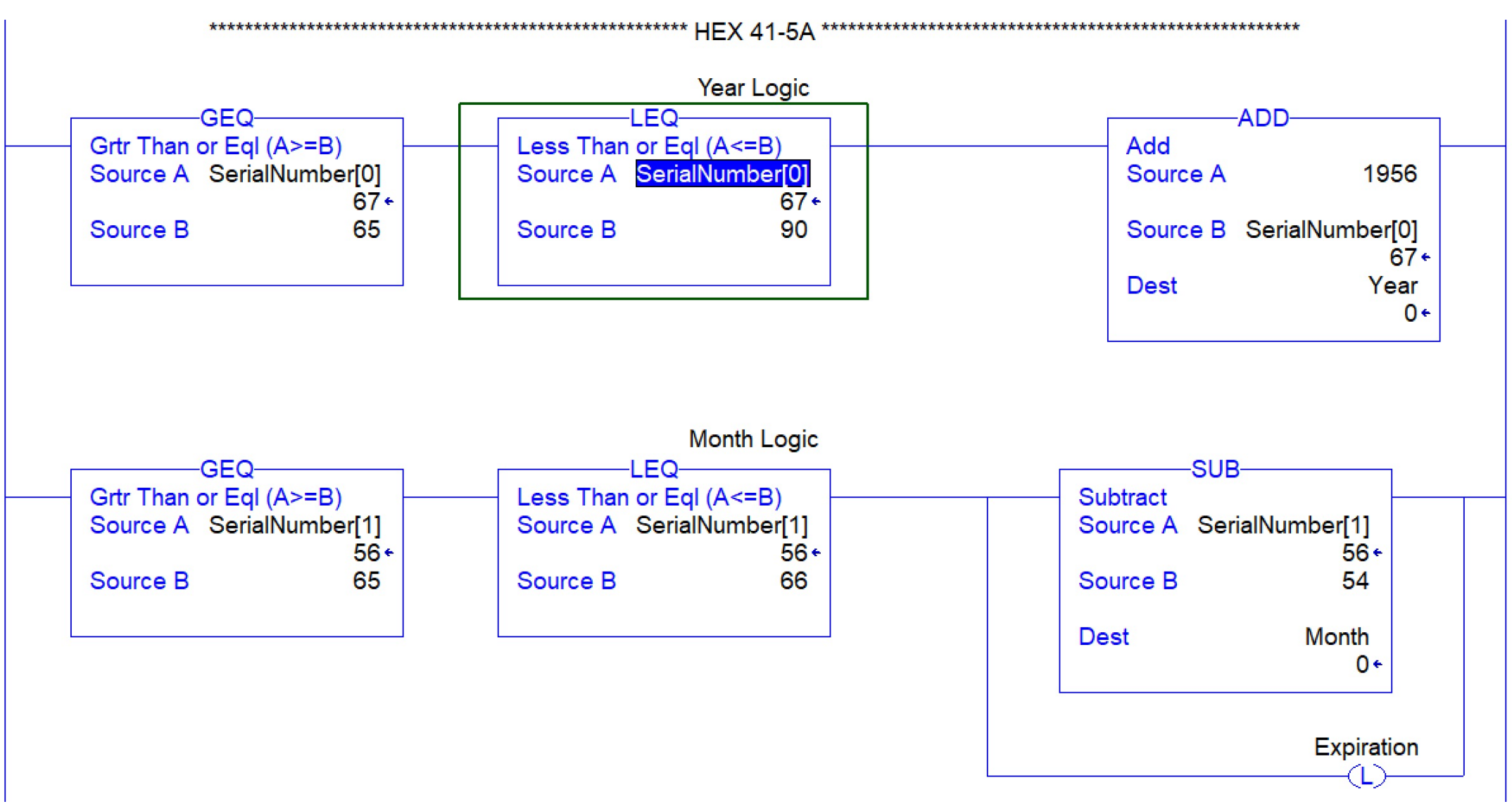
2

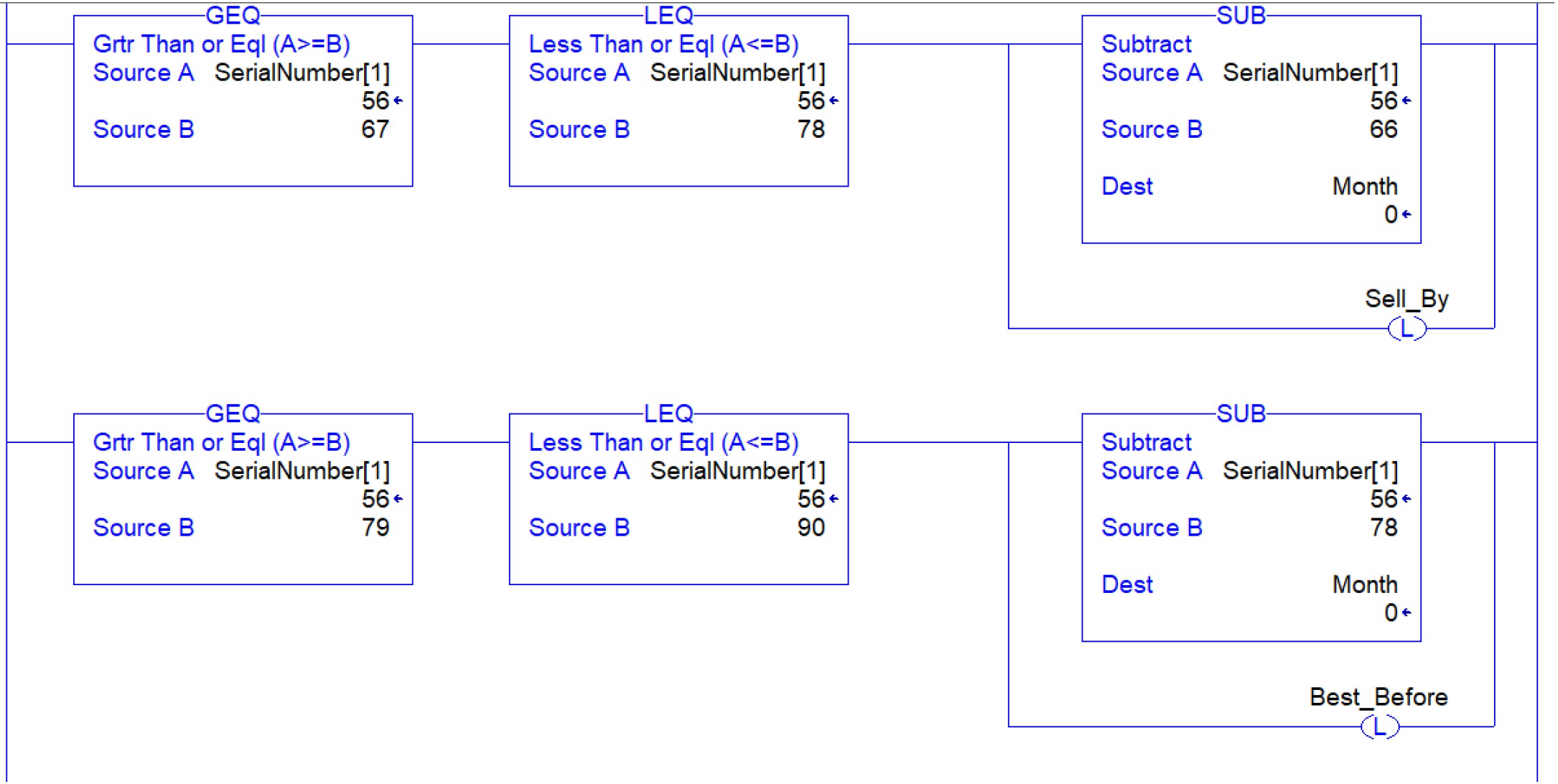
EQU	
Source A	tag.LEN
	26
Source B	26

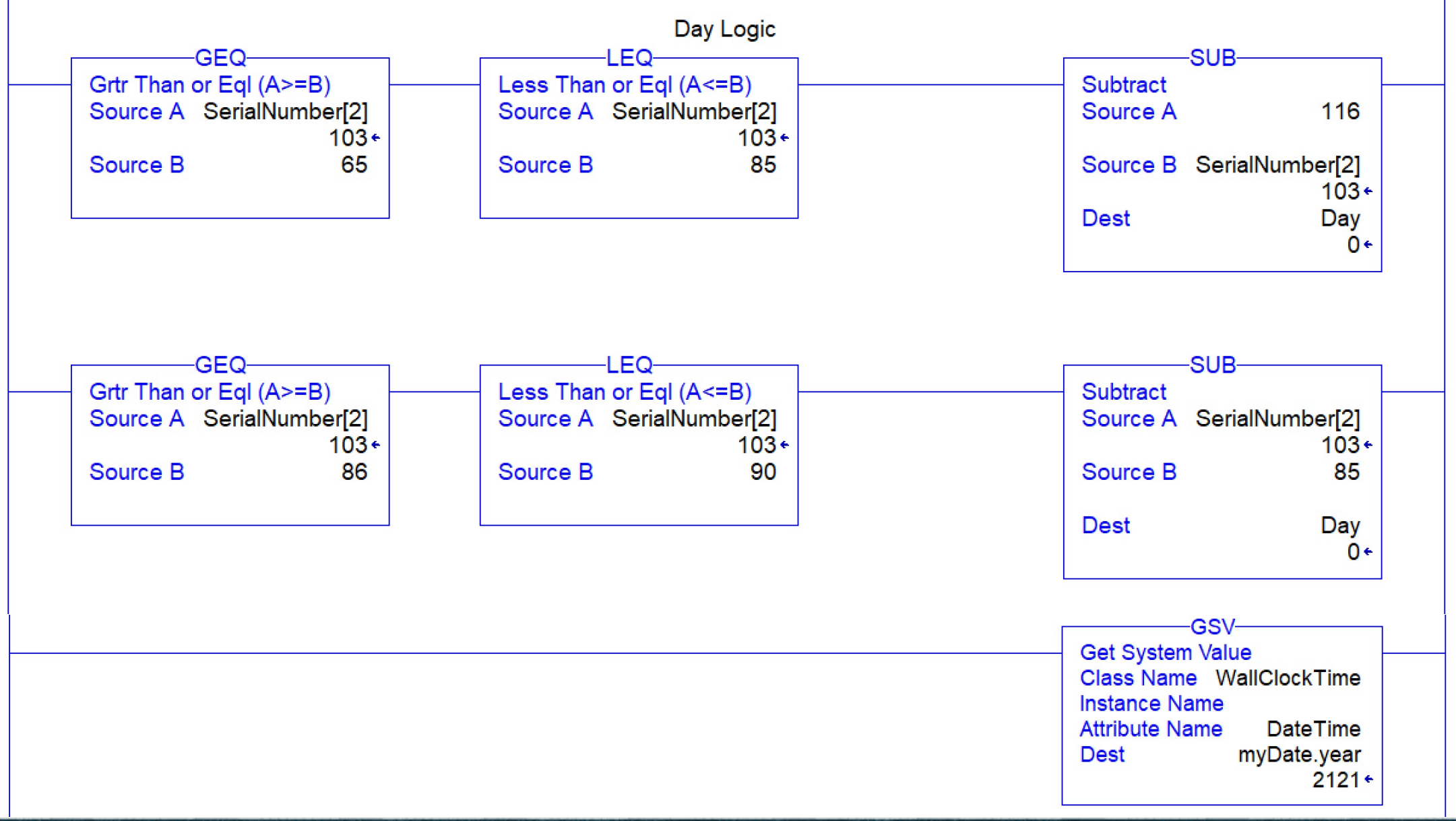
BTD	
Source	tag.DATA[7]
	'$A0'
Source Bit	0
Dest	SerialNumber[0]
	65
Dest Bit	1
Length	6

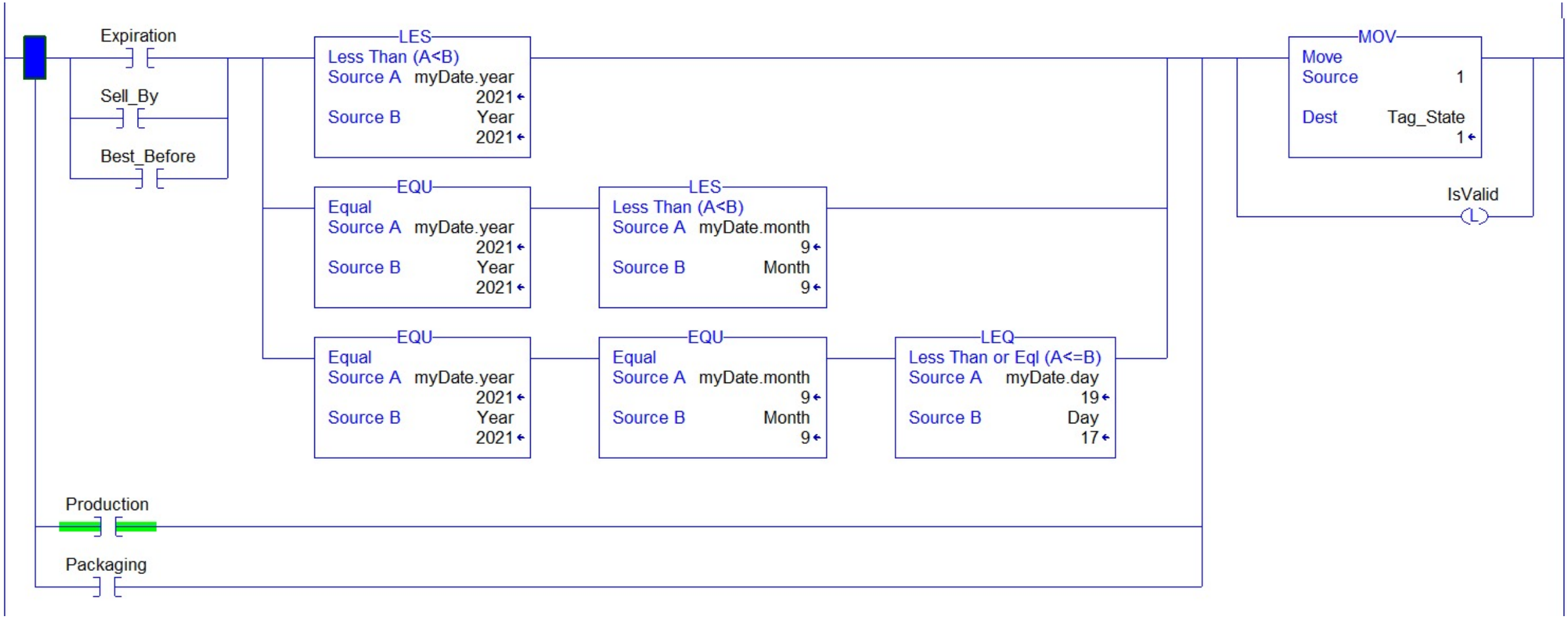
BTD	
Source	tag.DATA[8]
	'$CB'
Source Bit	7
Dest	SerialNumber[0]
	65
Dest Bit	0
Length	1

BTD	
Source	tag.DATA[8]
	'$CB'
Source Bit	0
Dest	SerialNumber[1]
	75

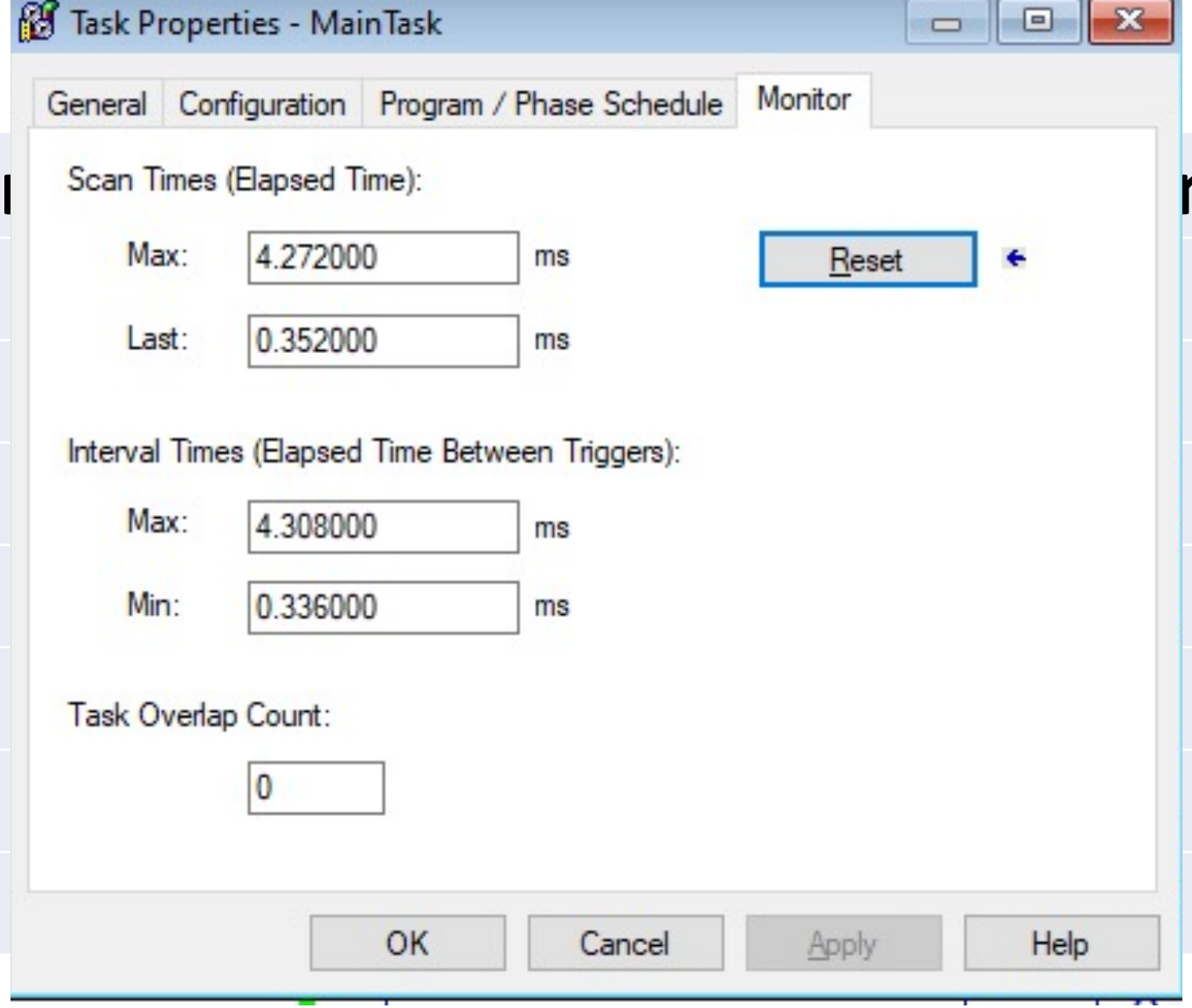

********** HEX 41-5A **********
Year Logic
GEQ
Grtr Than or Eql (A>=B)
Source A SerialNumber[0]
67
Source B 65
LEQ
Less Than or Eql (A<=B)
Source A SerialNumber[0]
67
Source B 90
ADD
Add
Source A 1956
Source B SerialNumber[0]
67
Dest Year
0
Month Logic
GEQ
Grtr Than or Eql (A>=B)
Source A SerialNumber[1]
56
Source B 65
LEQ
Less Than or Eql (A<=B)
Source A SerialNumber[1]
56
Source B 66
SUB
Subtract
Source A SerialNumber[1]
56
Source B 54
Dest Month
0
Expiration
L


GEQ
Grtr Than or Eql (A>=B)
Source A SerialNumber[1]
56
Source B 67
LEQ
Less Than or Eql (A<=B)
Source A SerialNumber[1]
56
Source B 78
SUB
Subtract
Source A SerialNumber[1]
56
Source B 66
Dest Month
0
Sell_By
L
GEQ
Grtr Than or Eql (A>=B)
Source A SerialNumber[1]
56
Source B 79
LEQ
Less Than or Eql (A<=B)
Source A SerialNumber[1]
56
Source B 90
SUB
Subtract
Source A SerialNumber[1]
56
Source B 78
Dest Month
0
Best_Before
L


Day Logic
GEQ
Grtr Than or Eql (A>=B)
Source A SerialNumber[2]
103
Source B 65
LEQ
Less Than or Eql (A<=B)
Source A SerialNumber[2]
103
Source B 85
SUB
Subtract
Source A 116
Source B SerialNumber[2]
103
Dest Day
0
GEQ
Grtr Than or Eql (A>=B)
Source A SerialNumber[2]
103
Source B 86
LEQ
Less Than or Eql (A<=B)
Source A SerialNumber[2]
103
Source B 90
SUB
Subtract
Source A SerialNumber[2]
103
Source B 85
Dest Day
0
GSV
Get System Value
Class Name WallClockTime
Instance Name
Attribute Name DateTime
Dest myDate.year
2121


Expiration
Sell_By
Best_Before
LES
Less Than (A<B)
Source A myDate.year
2021
Source B Year
2021
EQU
Equal
Source A myDate.year
2021
Source B Year
2021
LES
Less Than (A<B)
Source A myDate.month
9
Source B Month
9
EQU
Equal
Source A myDate.year
2021
Source B Year
2021
EQU
Equal
Source A myDate.month
9
Source B Month
9
LEQ
Less Than or Eql (A<=B)
Source A myDate.day
19
Source B Day
17
MOV
Move
Source 1
Dest Tag_State
1
IsValid
Production
Packaging

Parts per Mi	ms per Part
60	1000
100	600
200	300
400	150
600	100
1000	60
6000	10



Closing thoughts…

- Demand better adoption
- Inherent conversion to ASCII
- Common reader control access
- PLCs are functionally capable

Questions?

Kevin Berisso
University of Memphis
Automatic Identification Lab
kberisso@memphis.edu

THANK YOU

RFID JOURNAL LIVE!