



© 2010 - 2020 RTP Corporation

Not for reproduction in any printed or electronic media without express written consent from RTP Corp.

All information, data, graphics and statements in this document are proprietary intellectual property of RTP Corp. unless otherwise indicated and are to be considered RTP Corp. confidential. This intellectual property is made available solely for the direct use of potential or licensed RTP Corp. customers in their application of RTP Corp. products, and any other use or distribution is expressly prohibited. If you have received this publication in error, immediately delete, discard or return all copies to RTP Corp.

RTP Corporation 2832 Center Port Circle Pompano Beach, FL 33064 Phone: (954) 597-5333 Internet: http://www.rtpcorp.com

File Name: Redundant Hart Example N+.pdf Last Updated: 12/11/20

Hart Communications Card Configuration Overview

This document provides an example of how to configure the 3145 Analog Output card with Hart. Our hardware configuration example consists of connecting one of channel from the 3145 Analog Output Card to a Device with Hart Functionality.

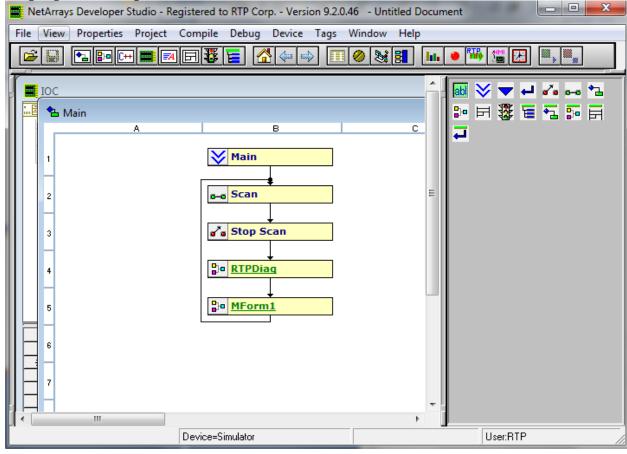
Hart Communications Card Installation

The channel 0 from the 3145 Analog Output card is connected to the Hart Device

In this example, the Hart Device will be powered by the 3145 Analog Output card..

Hart Protocol Port Configuration

• Open NetArrays and log in. If you have not created a user account please refers to the file ug-netsuite.pdf found in the directory C:\RTP NetSuite\Manuals. After logging in, you are going to see the figure below



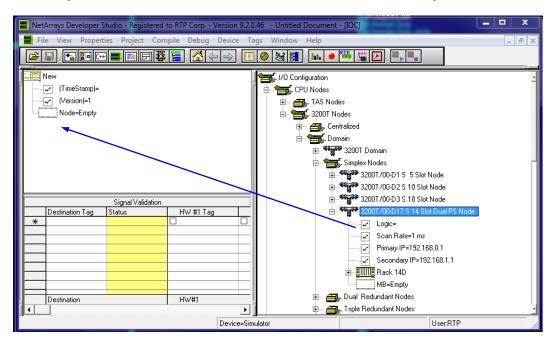
Click on the I/O Configuration Studio button in the NetArrays main toolbar

Maximize the I/O Configuration form using the Maximize Icon.

Drag an icon RTP3200T Node from the I/O Configuration Toolbox CPU Nodes->3200T Nodes->Domain->Simplex Nodes folder to the "Node=Empty" position on the I/O Configuration Form. For this example, the RTP3200T/00-D17 S 14 Slot Dual PS Node was chosen. Select an RTP3200T Node that matches your configuration. (This example shows a domain configuration).

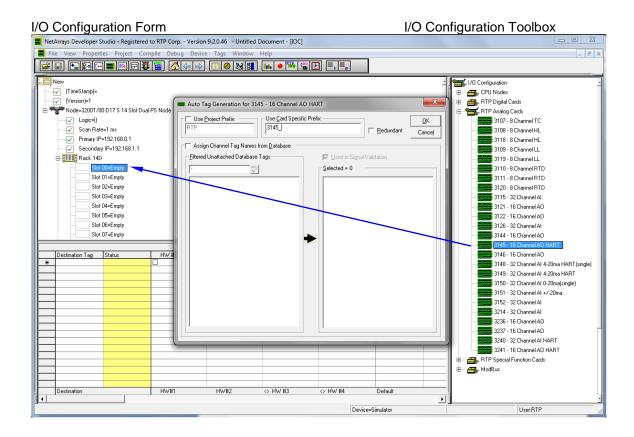
I/O Configuration Form

I/O Configuration Toolbox



Add a Hart Communications Card Add a Communications Card

In the I/O Configuration Form, expand the "Rack 00=Rack 14D" (left-click on the
. In the I/O Configuration toolbox expand the "RTP Analog Cards" branch (left-click on the
. Drag the "3145- 16 Channel AO Hart" icon to the "Slot 00=Empty". The Auto Tag Generation dialogue box will appear. Type in "3145_" and click OK. The Prefix of the Tag names for the Hart Communications Card will be set to "3145_".



After adding the card the system configuration will look like this.

NetArrays Developer Studio - Regis	tered to RTP Corp \	/ersion 9.2.0.46	- Untitled Doc	ument - [IOC]	
File View Properties Project	Compile Debug	Device Tags	Window He	lp	_ 8 ×
🕞 🔛 🔁 🗗 C++ 🧱 🖬 G	9 🐺 🧧 🛣 🗧	: 📫 🔲 🧭	88	ıı 👅 🌃 🔛	
(TimeStamp)=					
(Version)=1 ⊡- ⁰⁰ g ⁰⁰ Node=3200T/00-D17 S 14 Sto	t Dual PS Mada				
	(Dual F3 Noue				
Scan Rate=1 ms					
Primary IP=192.168.0.1					
	.1				
Back 14D					
Slot 00=3145 - 16 0	Channel AO HART				
Slot 01=Empty					
Slot 02=Empty					
Slot 03=Empty					
Slot 04=Empty					
Slot 05=Empty					
Slot 06=Empty					
Slot 07=Empty					
Slot 08=Empty Slot 09=Empty					
Slot 10=Empty					
Slot 11=Empty					
Slot 12=Empty					
Slot 13=Empty					
Slot 14=3200T Pro	cessor				
MB=Empty					
		Signal Validation			
Destination	H₩#1	- signal validation HW#2		> HW #3 <	> HW #4
	1				Þ
	Device=Simulator			User:R	TP //

NetArrays Project Program

You have completed the I/O configuration of the Hart Communications Card. The next step is to add some logic to the NetArrays project program to test the card's operation.

Save the Project

• First save the project. From the NetArrays File menu select Save New Project As... type the project name in File name: and click Save (We used "Hart".)

	NetAr	rays Dev	eloper Studi	io - Regist	tered to RT	P Corp	Version 9	.2.0.46	- Untitled	Docum	_ D X
	File	View	Properties	Project	Compile	Debug	Device	Tags	Window	Help	_ & ×
		New Pr	oject						Ctrl+N	hh 🧶) 🌇 🔛 📖
		Open P	roject						Ctrl+0		
<u>E</u>		Import	from PGM								-
		Save N	ew Project							I	
6		Save N	ew Project A	S							
		Save IO	C As								_
		Print IC	C						Ctrl+P	I	
		Print O	ptions							I	
		C:\RTP	NetSuite\Ne	tArrays\P	rojects\Mo	dbusTCP	Master.dk	on			
		Exit									
			Slot 03=I	Emoty							•
											•
				De	vice=Simula	itor					User:RTP

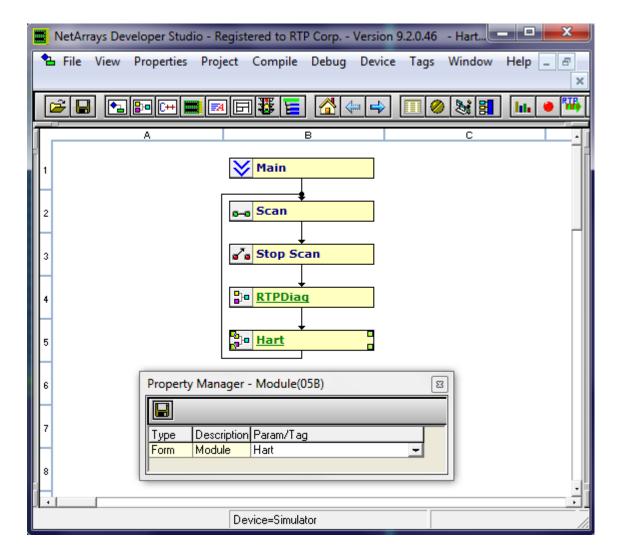
NetArrays	Developer Studio - Reg	istered to RTP Corp ¹	Version 9.2.0.46 - Untit	ed Document - [IOC]		X
File Vie	w Properties Projec	t Compile Debug	Device Tags Windo	w Help		_ 8 ×
<i>2</i>	▲ 🗗 대	8 🐺 🧧 🚰 🍕	· 🛶 🔲 🥔 😹	1 🖬 🗕 🚻 🖞	M 🔀 🐘 🐘	
New						
Π	Save Project As				×	
		NetArrays > Projects		Search Proje	cts 🔎	
	Organize 🔻 🛛 🔊	lew folder			:== 👻 🔞	
	🔒 SVN		▲ Name	<u>^</u>	Date mod	ir III III III III III III III III III I
	RTPVIEWS					
- 💷				No items match your	search.	
	퉬 UpdatingTu	torial	E			
	📃 Desktop					
	Eibraries					
	🔒 Fred Kampe					
	🖳 Computer					
	👊 Network					
	BACKUPC	OMPUTER	-		4	
	File name	: Hart.dbn			•	
		Project (*.dbn)				
	Surces type					
	A Hide Folders			Save	Cancel	
					,	
	MB=Empty					
			Signal V	alidation		
Destin	ation	H₩#1	HW#2	<> HW #3	<> HW #4	Default 🕂
			Device=Simulato	r		User:RTP

Modify the Main Flow Chart Form

In Modbus Hart.dbn project, click on the Maria icon.

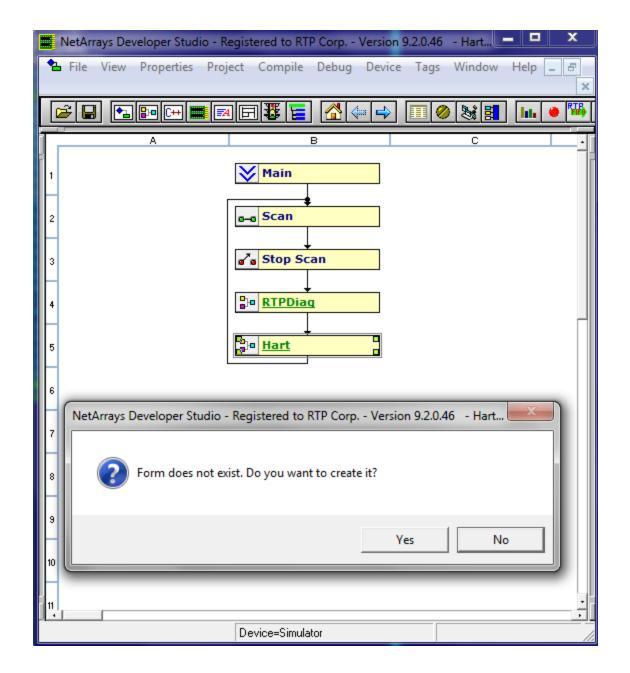
NetArrays Developer Studio - Re	gistered to RTP Corp Version 9.2.0.4	16 - Hart.dbn - [Main]	
🔁 File View Properties Proje	ct Compile <mark>Debug</mark> Device Tag	s Window Help	_ <i>6</i> ×
		<u> </u>) 🛗 🔛 🔍 🗮
A		С	
1	Main		
2	s-s Scan		
3	stop Scan		
4	Bie <u>RTPDiag</u>		
5	B ^{ID} MForm1		
6			
Resize Pane	Device=Simulator		User:RTP

• Right click on the **MForm1** and select **Properties** from the pop-up menu. In the Property Manager display, type in the Tag name **Hart**, followed by **Enter**. Close the Property Manager display



Construct the Hart Module Form

- Double-click on the Hart Module Form to display the module form.
- Select Yes to open Hart.



Right click in a blank area of the page and select **Properties**.

Net	rays Developer Studio - Registered to RTP Corp Version 9.2.0.46 - Hart
₿ ₽ Fi	View Properties Project Compile Debug Device Tags Window Help 🗕 🗗 🗙
2	▏▝▖▆ਯ▆▆▋▋▓▐▋▕▙▝▝▖▌▋▓▋▖▙▌▝▙
ī-	A B C D E
1	Properties
H.	Watch Plate
2	Copy As Is Ctrl+C
H.	Copy As New
3	Copy Tag Name(s)
ľ	Cut Ctrl+X
	Delete Del
4	Paste Ctrl+V
H.	Select All Ctrl+A
5	Find Tag(s) in Browser
H.	Trace Input Connection(s)
6	Help
H	
	Device=Simulator

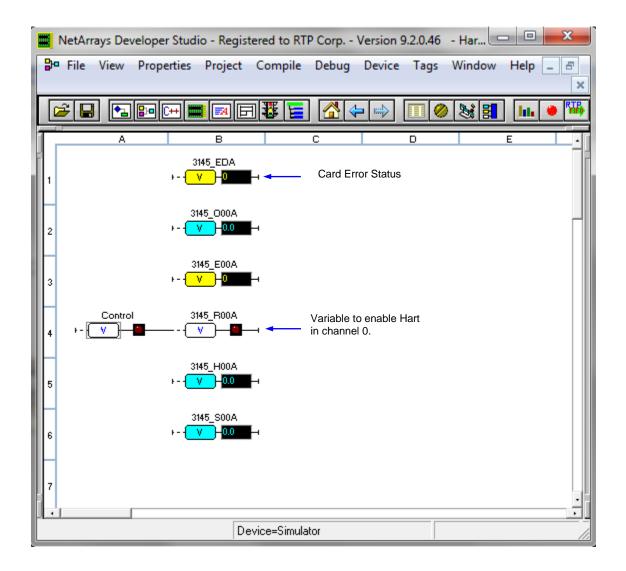
• Set "PartOfSIF" and "VariablesROnly" False. Close the Property Manager Window.

NetArrays Developer Studio - Registered to RTP Corp Version 9.2.0	X
📴 File View Properties Project Compile Debug Device Tags Windo	W
Help	- 8 ×
	3 1 III
A B C D	Ε.
1	
Property Manager - ()	
Form (Tag) Hart	
3 Param BackColor &HFFFFFF	
Param ForeColor &H80000012	
Param FrameColor &H80000002	
4 Param DisplayValue True	
Param ExecutionMode Horizontal	
Param VariablesROnly False	
Param PartOfSIF False	
6	
7	— ÷ i
Device=Simulator	

• Place the objects into the Module Form and connect the inputs to the outputs as shown in the following figures. Note: When entering a Tag name, you can either type the entire name or start typing the name and select the name from the available existing Tags. All of the I/O Tags will already exist as a function of the Auto Tag Generator. The Tag Prefix will be Hart_

Cell	Object	Properties
B1	Int Variable	(Tag) = 3145_EDA
B2	Float Variable	(Tag) = 3145_000A
B3	Int Variable	(Tag) = 3145_E00A
A4	Bool Variable	(Tag) = Control
B4	Bool Variable	(Tag) = 3145_R00A
B5	Float Variable	(Tag) = 3145_H00A
B6	Float Variable	(Tag) = 3145_S00A

Note: Any properties not listed are to remain at their default value.



The following addresses are going to be used for the system node in this example:

Device Name	Туре	IP Address1	IP Address 2
Hart	Single	89.89.89.105	89.89.89.106

Enter Node IP Address and Save File for the Hart Project.

• Left Click on **Node=3200T/00-D17 S 14 Slot Dual PS Node**, select **Properties**, and enter the IP Addresses of your RTP3201T Node Processor (Primary IP **89.89.89.105** and Secondary IP **89.89.89.106** as shown in the picture below.)

NetArrays	Developer Stud	lio - Regist	tered to RT	P Corp	Version 9	9.2.0.46	- Hart.d			23	J
File Vie	w Properties	Project	Compile	Debug	Device	Tags	Window	Help	-	Б×	
ž 🔒 [◆⊒ 📴 [++ 📕	.	1 🐺 🔚) 😹 🗄	h		₩ B j (†	41
	imeStamp)=10/7, ersion)=4 ode=3200T/00-D] Logic=()] Scan Rate=1] Primary IP=85	17 S 14 Slo ms		ode							
	Secondary IP Rack 14D MB=Empty Manager - 32	=89.89.89.1		Dual PS	Node()	Image: State Sta]]				
	-										
Type Param	Description Node Logic	Param/Tag Node=320) 0T/00-D17 (6 14 Slot D	ual PS N	ode					
Param Param	Scan Rate Primary IP	1 ms 89.89.89.1									
Param Param Card	Secondary IP Rack	89.89.89.1 Rack 14D MB=Empty				_					
	· 										
		De	vice=Simula	itor						L	

• Click on **Properties**, select **Project Serial.dbn** (name of the NetArrays project) **Properties**, and enter the IP Address of your RTP3201T Node Processor (**89.89.89.105** is shown as an example) in the **IPAddress** field in the **Property Manager** window.

	letArra	ys Dev	veloper Studio -	Regis	tered to RT	P Corp	Version 9	.2.0.46	- Hart.d			×	
	File	View	Properties Pro	oject	Compile	Debug	Device	Tags	Window	Help	-	8	×
	-		Project Ha	rt.db	n Properties	i) 😹 📰] [11.	۲	TI-	신물
层			Form IOC	Prope	erties			E F					
	New	(T)	For all oth	er obj	ects Mous	e Right Cl	ick it						
	-	(Versid			00110								
			=3200T/00-D17 S	14 SIa	a Dust PC M	ode							
11 -	Ę		Logic=()	14 010	(Duart 5 M	006							
			Scan Rate=1 ms										
			Primary IP=89.89.8	9 1 0 5									
			Secondary IP=89.8		106								
			Rack 14D	3.03.	100								
			MB=Empty										
	i		MD-Emply				_						
	Prope	rty Ma	inager - ()			٤	3						
	Туре		scription	Para	m/Tag		-						
	Param		fault Tag Prefix	RTP									
	Param		neStamp)		/2020 5:07:0	D4 PM							
	Param		rsion)	8									
	Param		x File	No									
	Param		bugDevColor		FDFDF								
	Param		bugSimColor ssWordDebug	&HD	5FFDB								
	Param Param		sswordDebug ssWordDownLoad	***									
	Param		.ddress		9.89.105								
	Faran		001622	103.0	5.63.105								
լլլ				_									
	_	_		_		_	_					_	=1
				De	evice=Simula	itor						l	. /

Note that **PassWordDebug** and **PassWordDownload** are set to "**rtp**" by default. If your RTP3200T Node has different passwords, change the **Properties** to match. Then use **your** passwords for the download and debug steps instead of "**rtp**".

• Save the project. From the NetArrays **File** menu select **Save Hart.dbn** (note that the name will be different if you saved the project file under another name).

Verification

Downloading the Program

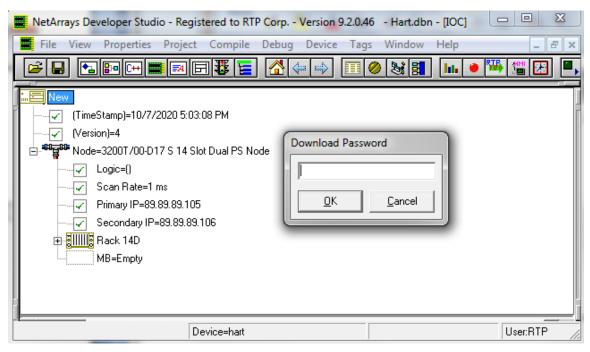
- Connect power to the chassis power supply.
- In NetArrays, select the target node containing 3145 Analog Output Card connected to the device with hart functionality from the **Device** > **Select** menu.

🗮 NetArrays Developer Studio - Registered to RTP Corp Versio	on 9.2.0.46 - Hart.dbn - [IOC]		
File View Properties Project Compile Debug Dev	ice Tags Window Help		_ & ×
Image: Section of the section of th	Select Configure Status Time Synchronize Node Information Download Project Download Project w/Online Update Upload Project Update Project		None default hart Simulator
Device=hart		Use	r:RTP

• Select Device and Download Project to download the project.

🗮 NetArrays Developer Studio - Registered to RTP Corp \	Version 9.2.0.46 - Hart.dbn - [IOC]	
File View Properties Project Compile Debug	Device Tags Window Help	_ <i>8</i> ×
Image: Secondary IP=89.83.89.106 Image: Secondary IP=89.83.89.106 Image: Secondary IP=89.83.89.106 Image: Secondary IP=89.83.89.106	Select Configure Status Time Synchronize Node Information Download Project Upload Project Upload Project Vpdate Project	
Device=hart	User	CRTP

• Enter the Download Password, we use **rtp**, and select **OK**.



• Click "Yes" to overwrite to the current Target Node.

NetArrays Developer Studio - Regi	stered to RTP Corp Version 9.2.0.46 - Hart.dbn - [IOC] 💷 🗵
File View Properties Project	Compile Debug Device Tags Window Help
	∃₩⊑ 4⇔⇒ Ⅲ⊘≥≋≣ № ●™ 22 ₽
(Version)=4 ⊡- ^{#0} ਛ ⁰⁰ Node=3200T/00-D17 S 14 S	Download : hart
	Perform download and overwrite hart target node ?
₽- Back 14D MB=Empty	<u>Y</u> es <u>N</u> o
D	evice=hart User:RTP

- Run the project in Debug mode by clicking on the **Run** button in the Main Toolbar.
- Enter the Debug Password, we use **rtp**, and select **OK**.

NetArrays Developer Studio - Registered to RTP Corp Version 9.2.0.46 - Hart.dbn - [IOC]	
File View Properties Project Compile Debug Device Tags Window Help	_ 8 ×
	🎙 🔚 🗵 🔍
New Image: Constraint of the system	
Device=hart IP=89.89.89.105	User:RTP

Verify Integer Module Form

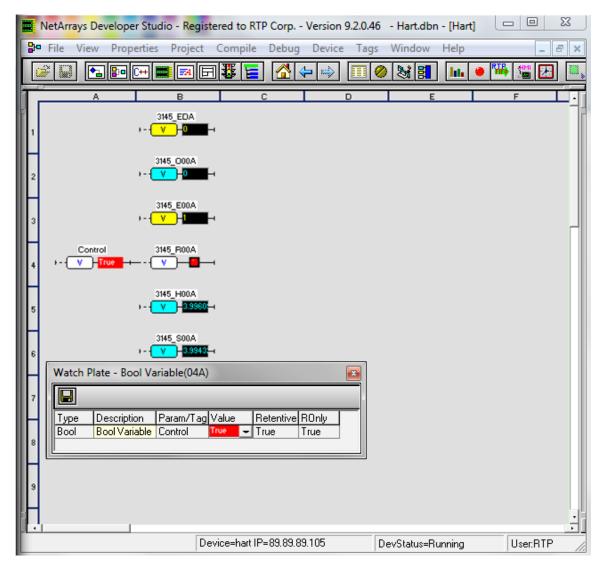
- Return to the Main Form by clicking on the $\frac{1}{2}$ button in the Main Toolbar.
- Double-click on the Hart object to open the Module Form.
- Right click once on the light of the Boolean Control variable as shown below. This will prompt Watch Plate Window that allows changing the value of the control variable.
 - Observe that the value of the variable 3145_H00A is equal to zero because the Boolean value of 3145_R00A is false.

Redundant Hart Communications Card Configuration Example

	NetArrays Dev	veloper Studio -	Registered to RTP Cor	o Version 9.2.0.46	5 - Hart.dbn - [Hart]	
₽	File View	Properties Pr	oject Compile Deb	ug Device Tags	Window Help	_ & ×
	2	📴 C++ 🧱 🛙	a F 🐺 🧧 🔏		ð 💐 🖪 🕨	• 🌃 🔛 📖
Г	A	E	; C	D	E	F .
1		3145_E + <mark>V</mark>				
2		3145_0 +	00A			
3		3145_E ⊁ -	00A			_
4	Control	3145_R	00A			
5		3145_H)	00A <u>38360</u>			
6		3145_S +	00A 39943			
IH	Watch Plat	e - Bool Variable	e(04A)	2		
7 8		escription Parar ool Variable Contr		re ROnly True		
9						
	I		Device=hart IP=89.8	3.89.105	DevStatus=Running	User:RTP

- Change the value Control Boolean Variable to True. This action activates the HART communication in the channel 0- of the 3145 Analog Output Card.
- Observe that the value of the variable 3145_H00A is changing because the Boolean value of 3145_R00A is TRUE. The 3145 Card is receiving data from the Hart Device.

Redundant Hart Communications Card Configuration Example



• If the input 3145_H00A is not changing after the Boolean variable 3145_R00A is set to TRUE, carefully check the configuration of the HART Communications Card and connection to the Hart device.

Status Window

The Status Window should show the RTP3200T Node's **Device Status:** = "**Running**". The bottom panel should be empty to indicate that there are no I/O Errors. The top panel shows historical messages.

	VetArrays De	veloper Stud	io - Regist	ered to RTP	Corp Version	9.2.0.46	- Hart.dbn	- [IOC]			x
	File View	Properties	Project	Compile I	Debug Device	e Tags	Window	Help		- 6	F ×
	ء 🖌	🗗 C++ 🔳	I 🛃 🗗	1 🐺 🔚	🐴 🔃 🔿		8	hi 🏓			
T.	Mau										
-	hart									×	
	Device N	lame: hart		Primary:	Nonredundant	Program:	Hart				
E	Device A	ddress: 89.89.3	89.105	Secondary:	N/A	Pass/See	c: 1000				
		ersion: 9.2.8.3	39	Tertiary:	N/A		itatus: Runn	ing - ROnly	Forces Exi	ist	
	Upda			Quaternary		Help					
	10/01/20) 16:06:50:680) 16:07:45:980	CCRack (PN New)), CP3200T B≀ File Received⊺	Sep 30 2020 SW uilt Sep 30 2020 S GPROG.PGM ntrol Forced TRL	SW A9.2.8.	39 HW 56				
			De	vice=hart IP=	89.89.89.105	De	evStatus=Ru	nnina	User:	BTP	

Congratulations! You have successfully completed the configuration and testing of a 3145 Analog Output Card with Hart.

RTP HART MULTIPLEXEX

RTP Hart multiplexex is a software utility from the RTP Netsuite aimed to acquire the Hart communication data from the node and transmitting out using the RS232 protocol

Go to the directory C:\RTP NetSuite\RTPHMX and open

🛃 RTPHMX.exe

🛃 Untitleo	d - RTP Hart	Multiplexer	× 100		
File Edit	View Ex	ecute Security Dev	ice Help		
🗋 🗅 🚅 🛛		<u>c</u> o			
Serial Port	t	Baud Rate	Device	Configure Multiplexers	
		9600			
Deada				Luce Mana	
Ready				user: None	11.

Change the configuration for the RTP Hart Multiplexer as follows: **Serial Port:** Choose COM2.

Baud Rate: Set the value 9600. This is the default value. Remember that the Baud Rate of the two serial com ports must be set to the same..

Device: Choose Hart.

Configure Multiplexers: Double-Left clicking on this field will open the Multiplexer Configuration pop-up window shown below.

Note: Serial Port, Baud Rate, and Device must be defined before the Multiplexer configuration pop-up window will become available.

🛃 Untitled - RTP Hart	Untitled - RTP Hart Multiplexer										
1	File Edit View Execute Security Device Help										
Serial Port Baud Rate Device Configure Multiplexers											
COM2 9600 Hart Double-click here to configure Multiplexers											
9600											
			\sim								
				Double Click to							
				open							
				Configuration							
				Configuration							
Brada											
Ready				user: None							

Modify the Multiplexer Configuration as following:

Go to the row for Subnode 0

- For the column Chassis 1 set the value equal to 0 because the card is located in the rack 1.
- For the column Card 1 set the value equal to 0 because the card is located in the slot 0.
- For the column Chassis 2, leave it blank because there is not a redundant card in the system.
- For the column Card 2, set leave it blank because there is not a redundant card in the system.
- Enable the entire set of loops from 0 to 15. Loops represent the channels on the HART capbable I/O Card. For this exercise, all the channels are enabled even though only one is wired to a Hart Device.

ort:	CC	IM2																		
evice:	Ha	art																		
fultiplexer	ter 1 Click or Right-Click Numbers or Check Boxes																			
All	Chassis 1	Card 1	Chassis 2	Card 2	Loop 0	Loop 1	Loop 2	Loop 3	Loop 4	Loop 5	Loop 6	Loop 7	Loop 8	Loop 9	Loop 10	Loop 11	Loop 12	Loop 13	Loop 14	Loop 15
Subnode 0	0	0			•	 Image: A start of the start of	•	•	•	 Image: A start of the start of	•	 Image: A start of the start of	~	~	 Image: A start of the start of	 Image: A start of the start of	•	~	~	~
Subnode 1																				
Subnode 2																				
Subnode 3																				
Subnode 4																				
Subnode 5																				
Subnode 6																				
Subnode 7																				
Subnode 8																				
Subnode 9																				
Subnode 10																				
Subnode 11																				
Subnode 12																				
Subnode 13																				
Subnode 14																				
Subnode 15																				

Untitled - RTP Hart	t Multiplexer										
File Edit View Ex	ecute Security Dev	vice Help									
🛛 🗅 🚔 🖬 🕨 🔳	6 Q										
Serial Port	Baud Rate	Device	Configure Multiplexers								
COM2	9600	9600 Hart Double-click here to configure Multiplexers									
	9600										
Ready		PHMX No items match III t.hmc P Hart Multiplexer Configu	er: None								

Click on OK.

Then	Go to fil	e and cli	ck on Sav	Δs Sa	ve this fil	e as Hart.hmc.
тпеп,	GO 10 III	e anu cii	uk un Sav	e As Sa		e as nait.iiiic.

Click on And start acquiring data. Click on the blue cell below and type Ctrl + C to copy the packet serial data out.

🛃 Hart.hmc - RTP Ha	art Multiplexer		_							
File Edit View E	xecute Security Dev	rice Help								
Serial Port	Baud Rate	Device								
COM2	9600	Hart								
	9600			T						
Ready										
				1						
Ready			user: None	11						

Open notepad and paste the collected data:

File Edit	Format	View H	elp								
Device	Multip	lexer	Subno	de Loop	Chass	is1	Card1	Chassis2	Card2 "Ins	strument Address" Value	"Time Stamp"
'Hart"	01 .	00	00	00 .	00	-1	-1	"130AA1A957"	3.996094	"10/07/2020 11:53:32.20	
'Hart"	01	00	01	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	02	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	03	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	04	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
Hart"	01	00	05	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	06	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	07	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	08	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	09	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	10	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	11	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	12	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	
'Hart"	01	00	13	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	0"
'Hart"	01	00	14	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	0"
'Hart"	01	00	15	00	00	-1	-1	"0000000000"	0.000000	"00/00/0000 00:00:00.00	0"

The captured data show that only one channel in the card is receiving data from a Hart Device. The value received is 3.996094 that is the same as the value captured in the NetArray Program.

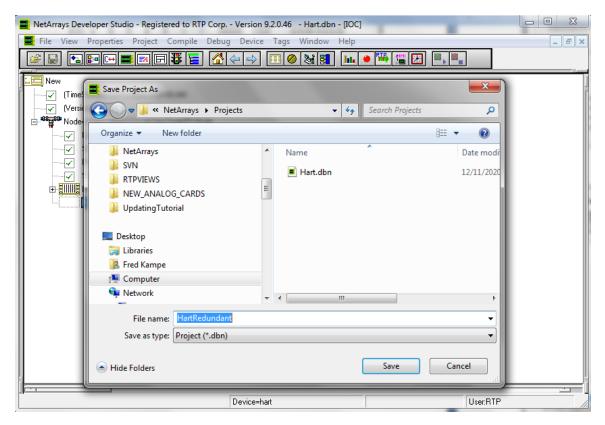
Congratulations! You have successfully completed the configuration of RTP HART MULTIPLEXEX.

Redundant Card Configuration

- At this point You have successfully completed the configuration and testing of a 3145 Analog Output Card with Hart.. Now, the next step of this example is to add a redundant card to the existing 3145 Analog Card.
- Save the current Netarray project by clicking on File and Save Hart.dbn

	VetAr	rays Developer Studio - Registered to RTP Corp Vers	sion 9.2.0.46	- Hart.dbn - [IOC]	
	File	View Properties Project Compile Debug De	vice Tags	Window Help	_ & ×
		New Project C	trl+N 🛛 🖉) 💐 🚮 🖬 🖷	
F		Open Project C	trl+0		
		Import from PGM			-
		Save Hart.dbn			
		Save Hart.dbn As			
		Save IOC As			
		Print IOC C	trl+P		
		Print Options			
		C:\RTP NetSuite\NetArrays\Projects\Hart.dbn			
		Exit			
	_				
Ŀ					
		Device=hart		l	Jser:RTP

	•	Go to File Save Hart.dbn As and save the program as	s HartRedu	undant.dbn	
	NetArr	ays Developer Studio - Registered to RTP Corp Version 9.2.0.46 - Hart.dl	on - [IOC]		3
	File	View Properties Project Compile Debug Device Tags Window	Help	_ 8	×
		New Project	Ctrl+N	🌇 🔚 🖪 🔍	
Ē		Open Project	Ctrl+O		4
		Import from PGM			
		Save Hart.dbn			
		Save Hart.dbn As			
		Save IOC As			
		Print IOC	Ctrl+P		
		Print Options			
		C:\RTP NetSuite\NetArrays\Projects\Hart.dbn			
		C:\RTP NetSuite\NetArrays\Projectss\STX_Example.dbn			
		C:\RTP NetSuite\NetArrays\Projectss\AlarmExample.dbn			
		C:\RTP NetSuite\NetArrays\Projects4\ModbusTCPMaster.dbn			
		Exit			
	_				
	*	Device=hart		User:RTP	=



 Go to the configuration panel and expand the Rack 14D as shown in the figure below and then, Right Click on Slot 00=3145 – 16 Channel AO HART and select Copy As Redundant.

NetArrays Developer Studio - Registered to RTP	2 Corp Version 9.2.0.46 - H 💶 💷 🗮 🏹
File View Properties Project Compile	Debug Device Tags Window Help
	E :
New (TimeStamp)=10/7/2020 5:03:08 PM (Version)=4 Node=3200T/00-D17 S 14 Slot Dual PS Node Scan Rate=1 ms Pimary IP=89.89.89.105 Secondary IP=89.89.89.106 Rack 14D Slot 00=3145 - 16 Channel AO H/ Slot 01=Empty Slot 02=Empty Slot 03=Empty Slot 05=Empty Slot 05=Empty Slot 05=Empty Slot 06=Empty Slot 07=Empty Slot 09=Empty Slot 10=Empty Slot 10=Empty Slot 10=Empty Slot 10=Empty Slot 10=Empty Slot 10=Empty Slot 11=Empty Slot 12=Empty Slot 13=Empty Slot 13=Empty Slot 14=3200T Processor MB=Empty	de
Device=hart	
Device-fiait]

 Go to Slot 01 = Empty, Rigl NetArrays Developer Studio - Reg 			
	t Compile Debug		Help _
			8 ×
			<u> </u>
New			
(TimeStamp)=10/7/2020 5:0	3:08 PM		
(Version)=4			
E-*** Node=3200T/00-D17 S 14 S	ôlot Dual PS Node		
Scan Rate=1 ms			
Primary IP=89.89.89.10			
Secondary IP=89.89.8 □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	3.100		
Slot 00=3145 - 16	S Channel AO HABT		
Slot 01=Empt			
Slot 02=Empt	Properties		
Slot 03=Empt	Copy As Is	Ctrl+C	
Slot 04=Empt	Copy As New		
Slot 05=Empt	Copy As Redunda	nt	
Slot 06=Empt	Copy Tag Name(s		
Slot 07=Empt	Cut	, Ctrl+X	
Slot 08=Empt	Delete	Del	
Slot 09=Empt	Paste	Ctrl+V	
Slot 10=Empt			
Slot 11=Empt	Find Tag(s) in Bro	wser	
Slot 12=Empt	Help		
Slot 13=Empt			
MB=Empty	Update References	5	
	Disable\Enable		
	Distributed Logic		•
	Device=hart		
	eenee nak		1

The configuration will look similar as the picture below.

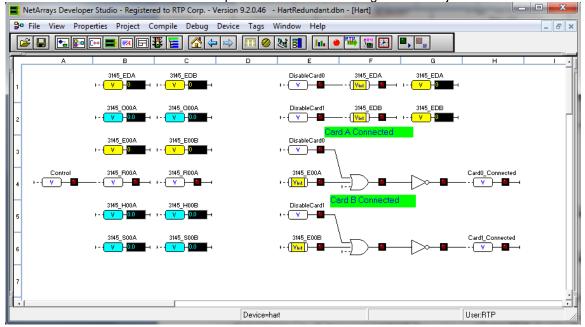
NetArrays Developer Studio - Registered to RTP Corp Version 9.2.0.46 - H
File View Properties Project Compile Debug Device Tags Window Help -
New -
(Version)=4
⊡-® 🙀 Node=3200T/00-D17 S 14 Slot Dual PS Node
E Rack 14D
Slot 00=3145 - 16 Channel AO HART
Slot 01=3145 - 16 Channel AD HART
Slot 02=Empty
Slot 03=Empty
Slot 04=Empty
Slot 05=Empty
Device=hart

• Return to the Main Form by clicking on the 🛣 button in the Main Toolbar and double click on the Integer Module.

Cell	Object	Properties
C1	Int Variable	(Tag) = 3145_EDB
E1	Bool Variable	(Tag) = DisableCard0
F1	Int BitVariable	(Tag) = 3145_EDA Bit = 14
G1	Int Variable	(Tag) = 3145_EDA
C2	Float Variable	(Tag) = 3145_000A
E2	Bool Variable	(Tag) = DisableCard1
F2	Int BitVariable	(Tag) = 3145_EDB Bit = 14
G2	Int Variable	(Tag) = 3145_EDB
C3	Int Variable	(Tag) = 3145_E00B
E3	Bool Variable	(Tag) = DisableCard0
C4	Bool Variable	(Tag) = 3145_R00A
E4	Int BitVariable	(Tag) = 3145_E00A Bit = 3

F4	Bool Or	
G4	Bool Inverter	
H4	Bool Variable	(Tag) = Card0_Connected
C5	Float Variable	(Tag) = 3145_H00B
E5	Bool Variable	(Tag) = DisableCard1
C6	Float Variable	(Tag) = 3145_S00B
E6	Int BitVariable	(Tag) = 3145_E00B Bit = 3
F6	Bool Or	
G6	Bool Inverter	
H6	Bool Variable	(Tag) = Card1_Connected

The Hart Module should look like the picture below after adding the new objects.



It is important to mention that the hart device can only be connected to one of the card at a time. This means that one of the cards is connected to the Hart device, the second card is on "Standby" waiting in case the other card is disable or stops working. Consequently, only one of the two variables Card0_Connected and Card1_Connected can be set to TRUE at a time. The logic below defines the signal validation mechanism of the Hart Device when it is connected redundantly. The Card Status and Channel Status are used to determine which of the two cards are connected to validate the source of the incoming signal value.

Verification

Downloading the Program

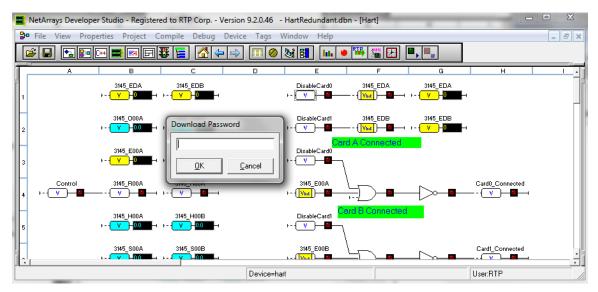
- Make sure that the 3145 Analog Cards are installed and connected to the Hart Device
- In NetArrays, select the target node containing the HART Cards from the **Device Select** menu.

🗮 NetArrays Developer Studio - Registered to RTP Corp \	/ersion 9.2.0.46 - HartRedundant.dbn - [IOC]		
File View Properties Project Compile Debug	Device Tags Window Help		_ 8 ×
File View Properties Project Compile Debug Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.105 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.106 Image: Secondary IP=89.89.105 Image: Secondary IP=80.106 Image: Secondary IP=80.106 Image: Secondary IP=80.106 Image: Secondary IP=80.106 Image: Secondary IP=80.106 Image: Secondary IP=80.106 Image: Secondary IP=80.106 Image: Secondary IP=80.106 Image: Second	Device Tags Window Help Select Configure Status Time Synchronize Node Information Download Project Download Project w/Online Update Upload Project Update Project	► ► ►	Image: second secon
Slot 04=Empty			•
Device=hart		Use	er:RTP

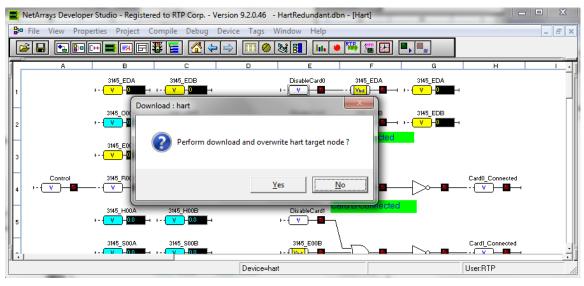
• Select Device and Download Project to download the project.

NetArrays Developer Studio - Registered to RTP	Corp Version 9.2.0.46 - HartRedundant.dbn - [Har	rt]
Properties Project Compile	ebug Device Tags Window Help	_ <i>8</i> ×
	Select	
	DE Status Time Synchronize Node Information	
3	Upload Project Update Project	* *
4 +- V V V V		
3145_H00A 3145_H 5	00B DisableCard	
	Device=hart	User:RTP ///

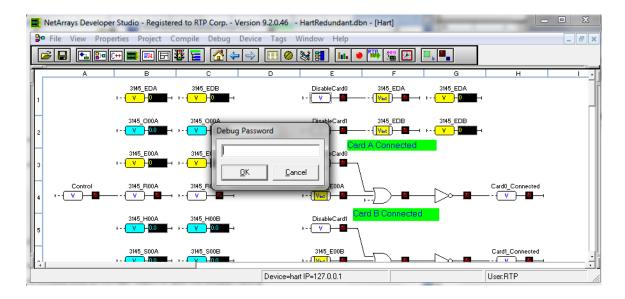
• Enter the Download Password, we use **rtp**, and select **OK**.



• Click "Yes" to overwrite to the current Target Node.

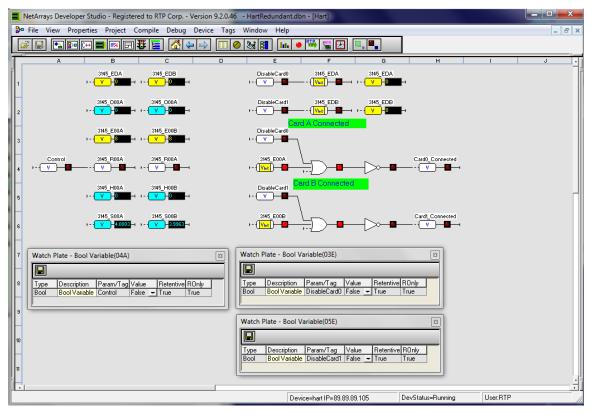


- Run the project in Debug mode by clicking on the **Run** button in the Main Toolbar.
- Enter the Debug Password, we use **rtp**, and select **OK**.

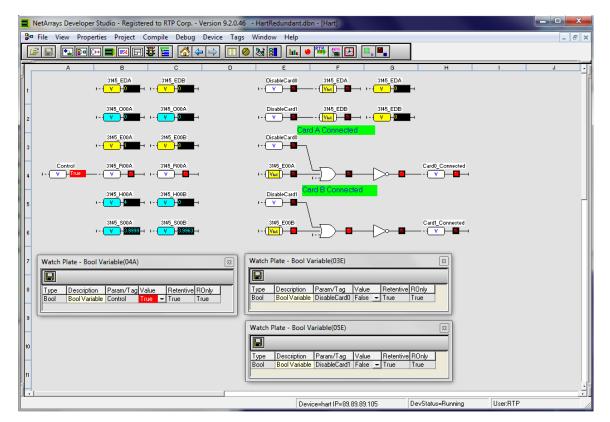


Verify Integer Module Form

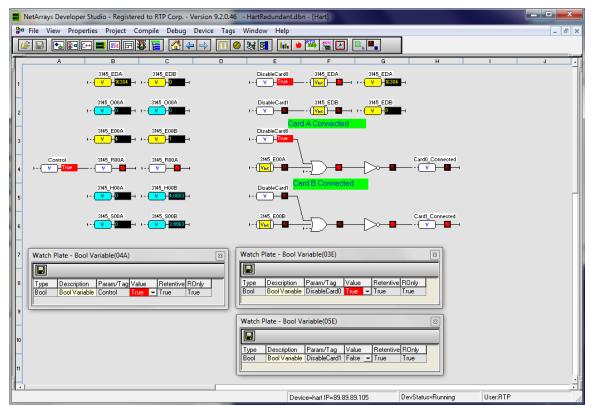
- Return to the Main Form by clicking on the Δ button in the Main Toolbar.
- Double-click on the Hart object to open the Module Form.
- Right click once on the light of the Boolean Control variable as shown below. This
 will prompt Watch Plate Window that allows changing the value of the control
 variable.
- Right click once on the light of the Boolean DisableCard0 variable as shown below. This will prompt Watch Plate Window that allows enabling the redundant 3145 Analog Output card in slot 0.
- Right click once on the light of the Boolean DisableCard1 variable as shown below. This will prompt Watch Plate Window that allows enabling the redundant 3145 Analog Output card in slot 1.



• Change the value Control Variable to True. This action activates the HART communication in the channel 0- of the 3145 Analog Output Card.

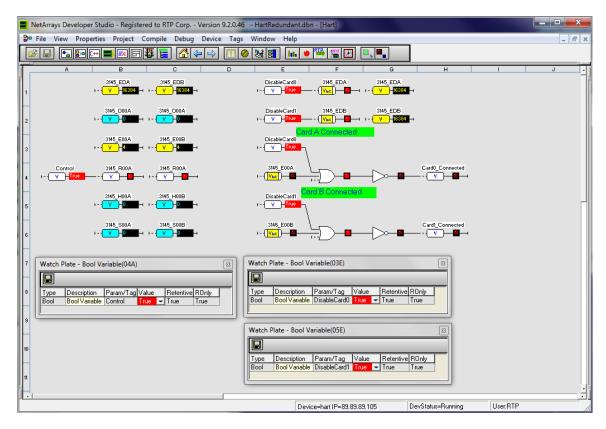


- Observe that the value of the variable 3145_H00A is changing because the Boolean value of 3145_R00A is TRUE. In addition, the card status indicates that the card is connected to the hart device because the Card0_Connected variable is set to TRUE. The 3145 Card is receiving data from the Hart Device.
- If the input 3145_H00A is not changing after the Boolean variable 3145_R00A is set to TRUE, carefully check the configuration of the HART Communications Card and connection to the Hart device.
- Go to the Watch Plate for the Boolean DisableCard0 Variable and change it to True.



• This action disables the 3145 Card on slot 0.

- Observe that the value of the variable 3145_H00B is changing because the second card (3145 Analog Output Card on the slot 01) has taken control over the hart device. In addition, the card status indicates that the card is connected to the hart device because the Card0_Connected variable is set to TRUE.
- Go to the Watch Plate for the Boolean DisableCard1 Variable and change it to True.
- This action disables the 3145 Card on slot 1. Now, both cards have been disabled.



• Observe that the value of the variable 3145_H00A and 3145_H00B is equal to zero because neither of the two cards are connected to the hart device.

Status Window

The Status Window should show the RTP3200T Node's **Device Status:** = "**Running**". The bottom panel should only show a message indicating that the 3145 Card on slot 0 is offline because at the end of the testing the card has been disabled. The status window indicates the system has no errors during initialization. In addition, the logs show that the variables Control, DisableCard1 and DisableCard0 have been changed to TRUE.

NetArrays Develope	ber Studio - Registered to RTP Corp Version 9.20.46 - HartRedundant.dbn - [Hart]	
Propertie File View Prope	perties Project Compile Debug Device Tags Window Help	- 8 ×
A	B C D E F G H I	J
Π. –	3145_EDA 3145_EDB DisableCard0 3145_EDA 3145_EDA	Γ
	hart	
	Device Name: hart Primary: Nonredundant Program: Testing	
	Device Address: 89.89.89.105 Secondary: N/A Pass/Sec: 999	
	Device Version: 9.2.0.0 Tertiary: N/A Device Status: Running-1/0 Errors Exist	
3	Vpdate Quaternary: N/A Help	
H Outral	10/08/20 13:43:14:333 P 0 3200T[2] D00 Built Sep 30 2020 SW A9:2.8:39 BL A9:2.0:39 HW 11 10/09/20 13:43:14:332 P 0 Researce A Primary Online	
4 + V True	10/08/20 13:43:14:333 P 0 Processor A - Primary Online Card0_Connected 10/08/20 13:43:14:336 C C Rack 0 CP3200T Built Sep 30 2020 SW A9:2.8.39 HW 99 Card0_Connected	
	10/08/20 13:43:38:883 P 0 R0 Bool Variable Control Forced TRUE	
	10/08/20 13:43:50:086 E 0 R0 Bool Variable DisableCard0 Forced TRUE 10/08/20 13:43:50:087 C C Rack 0 Slot 0 - Card Offline Disabled	
5	10/08/20 13:44:03:333 P 0 R0 Bool Variable DisableCard1 Forced TRUE	
	10/08/20 13:44:03:334 C C Rack 0 Slot 1 - Card Offline Disabled 10/08/20 13:44:11:776 P 0 R0 Bool Variable DisableCard1 Forced FALSE Card1_Connected	
6	10/08/2013/44117/670 C Rack 0 Stot 1 Card Online	
7 Watch Plate - B		
	10/08/20 13 43:50:087 C C Rack 0 Slot 0 - Card Offine Disabled	
8 Type Descrip		
Bool Bool Va		
9		
10		
	Device=hart IP=89.89.89.105 DevStatus=Running User:RTP	11.