Translating Modbus coils to LonWorks SNVT_switch NV's

This article describes the process for having the BB2-LON gateway read Modbus coils from a Modbus slave and providing that data as a SNVT_switch Network Variable Output. The same process applies for monitoring Modbus discrete inputs from LonWorks via SNVT_switch network variables. If an input register or holding register contains packed bits with up to 16 states represented in the same register, you can apply this same principle if you add a bit mask to the map to select a specific bit from the 16-bit register. To control coils from LonWorks, reverse the process, mapping a Network Variable Input to writing a Modbus coil.

Note: The process described here requires BB2-LON device firmware v3.10.9 or higher, and configuration tool v2.15 or higher.

The example we will work with starts out with a CSV file containing a set of 4 coils that will be read by the BB2-LON gateway.

Chiller.csv - Notepad File Edit Format View Help RW,REG,TYPE,FORMAT,NAME R,1009,COIL,BIT,CP-1 High Pressure R,1010,COIL,BIT,CP-2 High Pressure R,1011,COIL,BIT,CP-1 Low Pressure R,1012,COIL,BIT,CP-2 Low Pressure

From the Reg Import page, the file illustrated above was opened. All registers were selected and added to the Reg List.

Configuration	/orks-Modbus Gateway No	Tool v2.1	4		
	≅ ⊘ 			Cor	nnected: 😰 Sync: 😰
port NV List	t Reg Import Reg List N Reg List 4 entries added to	Master List	View Dat	a Modbus Port Set Slave Addr	LonWorks
Format	N Type Reg # F	Slave	Packed	High Reg First	Name
BIT BIT BIT BIT	COIL 1009 - COIL 1010 - COIL 1011 - COIL 1012 -		N N N	N N N N	CP-1 High Pressure CP-2 High Pressure CP-1 Low Pressure CP-2 Low Pressure

The register list on the Reg List tab initially has no assignments.

🛢 LonWorks-Modbus	Gatewa	/ Node Configur	ation 1	iool v2.1	4			
Connect Reg Import	Reg List	NV Import NV	List M	Master List	View	Data M	Conr odbus Port	ected: 😰 Sync: 🕱 LonWorks 💌Execute
EB# Obi#	R/W Tw	e Reg.#	Bit #	Eormat	Slave	Packed	Hireo 1st	Reg Name
	R CO R CO R CO	IL 1009 IL 1010 IL 1011 IL 1012		BIT BIT BIT BIT		N N N	N N N	CP-1 High Pressure CP-2 High Pressure CP-1 Low Pressure CP-2 Low Pressure

Next, on the Reg List page, the "Auto-create NV's and assign FB #'s" was executed. Then "Auto-assign data objects" was executed. The register list now looks like this:

🖉 Lor	nWorks	Modbus	s Gate	way No	de Configu	ration 1	Fool v2.1	4			
Conr	hect Ri nsert Reg	eg Import	Reg opend F	List N\ }eg	/Import N Delete	V List 1	Master List assign data	View	Data M	Conr odbus Port	nected: 😰 Sync: 👿 LonWorks ▼ Execute
F	=B #	Ohi#	R/W	Type	Reg #	Bit #	Eormat	Slave	Packed	Hirea 1st	Reg. Name
	DL5 1 DL5 2 DL5 3 DL5 4		R R R	COIL COIL COIL COIL COIL	1009 1010 1011 1012		BIT BIT BIT BIT		N N N	N N N	CP-1 High Pressure CP-2 High Pressure CP-1 Low Pressure CP-2 Low Pressure

Next, we go to the NV List, which initially looks like this:

2 L	onWo	rks -Modb	us Gatev	way Node Configur	ation Tool v2.14		
Co [N	nnect No actio		rt Regil opend NV	_ist NV Import NV	List Master List View Data ixecute Delete	Connected: 😰 Sync: 💈	
	Dir	EB #	Obi#	SNVT Type	SNVT Category	NV Name	1
	NVO NVO NVO	OL5 1 OL5 2 OL5 3 OL5 3 OL5 4		SNVT_count SNVT_count SNVT_count SNVT_count		CP-1 High Pressure CP-2 High Pressure CP-1 Low Pressure CP-2 Low Pressure	

For each coil to be converted to SNVT_switch, double click the NV line to open the NV Editor dialog. Select SNVT_switch from the SNVT Type list. Secondly - and this is important - select Special Conversion from the Method list. Then click Apply.

The Modbus coil is very basic 1-bit value with a 0 representing off and 1 representing on. The only "switch" available in LonWorks is SNVT_switch which is a 2-part structure designed for dimmable switches. The first part of SNVT_switch is the dimming level that may be 0% to 100%. The second part is state, either on or off. In most cases, LonWorks devices will not treat a "switch" as "on" unless state is set to ON, and level is something greater than 0%.

If you did not select the Special Conversion (which defaults to formula 1 for SNVT_switch), you would need to provide two Modbus registers per SNVT_switch, one mapped to level (and must be capable of 0-100%), and the other mapped to state. The Special Conversion supported by the BB2-LON gateway automatically converts the Modbus data to both parts of the SNVT_switch structure.

🗧 LonWorks-Mod	bus Gateway Node Configuration Tool v2.14		
Connect Reg In	S NV Editor	Connected: 😰 Sync: 😰	
No action Insert NV Dir FB # NVO OLS 1 NVO OLS 2 NVO OLS 3 NVO OLS 4	Name CP-1 High Pressure SNVT Type SNVT_switch Direction NMI Min SndT 0 00:00:15 Min SndT 0 00:00:15 MV Category NVT_CAT_STRUCT Scale A 0 Byte Offset 0 Bit Offset 0 FB (0LS)# 1 Object # Apply Cancel	Method Special Conversion Formula 1 [S] PID [0] 00:00:00:00:00:00:00:00 NV Size 2 Scale C 0 Is Lock Yes Auto Assign	

When the NV type changes have been completed, the NV List now looks like this:

LonWo	rks-Modb	us Gatev	way Node Configuratio	on Tool v2.15		
] 🚼 onnect	I 🛛 🕜 🛛 Reg Impo	nt Regi	List NV Import NV List	Master List View Data M	Connected: 👿 Sync: Modbus Port LonWorks	
No actio	on		✓ Exec	sute		
Insert	NV A	ppend NV	Add Field Dele	ete		<u>×</u>
Dir	FB #	Obj #	SNVT Type	SNVT Category	NV Name	
NVO NVO NVO NVO NVO NVO NVO NVO NVO NVO	OLS 1 OLS 1 OLS 2 OLS 2 OLS 2 OLS 2 OLS 3 OLS 3 OLS 3 OLS 3 OLS 4 OLS 4 OLS 4	1 	SNVT_switch :: value :: state SNVT_switch :: value :: state SNVT_switch :: value :: state SNVT_switch :: value :: state SNVT_switch :: value :: state	nvt_cat_unsigned_short nvt_cat_signed_short nvt_cat_unsigned_short nvt_cat_signed_short nvt_cat_signed_short nvt_cat_unsigned_short nvt_cat_unsigned_short nvt_cat_unsigned_short nvt_cat_signed_short	CP_1_High_Pressu nvoSenValue_1 nvoSenValue_1 CP_2_High_Pressu nvoSenValue_2 nvoSenValue_2 CP_1_Low_Pressur nvoSenValue_3 nvoSenValue_3 CP_2_Low_Pressur nvoSenValue_4 nvoSenValue_4	

Now move to the Master List, which will look like this:

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S	end Obj	ect map	os to devici	e	<u> </u>	Exe	cute	Object #3 written ok. Object #4 written ok.		2
_							1			<u> </u>
	Obj #	R/W	Туре	Reg #	Slave	Dir	FB #	SNVT Type	Object Name	<u>^</u>
	1	R	COIL	1009	1	NVO	OLS 1	SNVT switch	CP-1 High Pressure	
	2	R	COIL	1010	1	NVO	OLS 2	SNVT_switch	CP-2 High Pressure	
	3	R	COIL	1011	1	NVO	OLS 3	SNVT_switch	CP-1 Low Pressure	
	4	R	COIL	1012	1	NVO	OLS 4	SNVT_switch	CP-2 Low Pressure	
	5	1.	NONE	0	0					
	6	-	NONE	0	0	2000	2000			
•	7	5	NONE	0	0	935	1755	377.0		
•	8	120 I.	NONE	0	0	3220	322	2028		
•	9	18 19	NONE	0	0	3 933	3 923			
	10	100	NONE	0	0	2000	2000			
•	11	5	NONE	0	0	975	1755	377.0		
•	12		NONE	0	0	3336	322	22.83		
	13		NONE	0	0	3 933	(111)	1000 (<u>1000)</u>		
	14	10	NONE	0	0	2000	2000			
•	15	52	NONE	0	0	1235	1225	3372		
•	16	2	NONE	0	0	322	822	222		
•	17	1	NONE	0	0	3 933	(111)	10000000000000000000000000000000000000		
•	18	10	NONE	0	0	2000	2777			
•	19	20	NONE	0	0	233	1735			Y
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Double click on a Modbus related area of the line to open the Modbus Register Editor dialog. Enter 100 for Scale/Slope. Click Apply. Do this for all of the coils.

As noted above, SNVT_switch expects a level in the range of 0-100%. The data value of a coil will be either 0 or 1. To convert that 1 to 100%, a scale factor of 100 is used. If you wanted the coil to only set the LonWorks side to 50%, you would enter a scale factor of 50 instead of 100.

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ē	4	P		egister Format	Dooleanivbit		1.0	Mask (nex)	10000000		
ē	5	1	P	oll Rate (Sec)	1			Fill (Hex)	00000000		
	6				line.						
•	7	-	3	Scale/Slope	100			📃 🔲 High Reg Fin	st if Double		
٠	8	1	OB	feet/Intercept	0.00000			E. U. 1. (D	1 15 11		
	9	*	01	iseomiercepi	10.00000			Member of P	acked Register		
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	18	*	NONE	0	0		-				
•	19	-	NONE	0	0		-	7.0			~
-				-	115						1

The internal object data format will default to bit/boolean when the Modbus register is a coil. In order to make the scaling work, you must change the internal data format to Unsigned Integer. Double click on the object number to open the Object Editor dialog. Select "16-bit Unsigned Int" for Data Format and click Apply.

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Cc] 😅 onnect	Reg In		2	, ,		·	. 1		Conne	cted: 🗹 Syno		
5	Send Obj	ect map		et Eu									
	Obj# 1 2 3 4 5 6 7 8 9 10 11 12 13	R/W R R R R 		Obj	ect Number 1 Data Format Default Value	CP-1 Hi 16-bit U Set [Set [0	gh Pressure nsigned Int Default on Po Default on Co	▼ wer-Up mm Fail	C Object is	Persistent		e e e e	
	14 15 16				Apply		Cancel						
	18 19		NONE	0	0	,070 (575)		, (, (

You are now ready to send the configuration to the device. From the Master List, select "Send NV definitions to device" and click Execute. Next, select "Send Object maps to device" and click Execute. (This assumes you have connected the USB cable, selected the port on the Connect page, and clicked Connect with successful results prior to clicking Execute.)

Once configured, the data illustrated in this Modbus simulator screen shot...

118 ModSim32 - ModSim1 File Connection Display Window	Help	
ModSim1		
Address: 1000 01 Length: 100	Device Id: 1 MODBUS Point Type : COIL STATUS	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	01054: 01081: 0) 01055: 01082: 0) 01055: 01082: 0) 01056: 01083: 0) 01057: 0) 01084: 0) 01057: 0) 01084: 0) 01058: 0) 01085: 0) 01059: 0) 01086: 0) 01060: 0) 01087: 0) 01061: 0) 01087: 0) 01061: 0) 01088: 0) 01061: 0) 01089: 0) 01061: 0) 01089: 0) 01062: 0) 01090: 0) 01063: 0) 01091: 0) 01063: 0) 01091: 0) 01065: 0) 01092: 0) 01066: 0) 01093: 0) 01068: 0) 01097: 0) 01070: 0) 01097: 0) 01071: 0) 01098: 0) 01072: </td <td></td>	

...will appear as illustrated here on the View Data tab after selecting "Get Object data values" and clicking Execute.

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aet ubje	ct data	values		I	Exe	sule	Object #3 read ok.		
						ľ	object #4 read ok.		~
1				1-1-1-	1	, ,	1		
Obj #	R/W	Туре	Reg #	Slave	Dir	FB #	Object Name	Data Value	
1	R	COIL	1009	1	NVO	OLS 1	CP-1 High Pressure	100	
2	R	COIL	1010	1	NVO	OLS 2	CP-2 High Pressure	0	
3	R	COIL	1011	1	NVO	OLS 3	CP-1 Low Pressure	100	
4	R	COIL	1012	1	NVO	OLS 4	CP-2 Low Pressure	0	
5	R.	NONE	0	0				Undef	
6	15	NONE	0	0	2777	2000		Undef	
7	52	NONE	0	0	1775	1730		Undef	
8		NONE	0	0	1920	3220		Undef	
9	18. 19.	NONE	0	0	3 933	3 933		Undef	
10	15	NONE	0	0	2777	2000		Undef	
11	52	NONE	0	0	1755	1233		Undef	
12	12	NONE	0	0	1920	200		Undef	
13	1	NONE	0	0	3444	3 111		Undef	
14	-5	NONE	0	0	2000	2000		Undef	
15	5	NONE	0	0	1755	1235		Undef	
16	1	NONE	0	0	3220	3222		Undef	
17	*	NONE	0	0	3424 	3 123		Undef	
18	-2	NONE	0	0	2000	2		Undef	
19	-	NONE	0	0	1255	0735		Undef	
			-					15.17 G. A.	1

When the local object contains the value 100, the SNVT_switch will produce a level of 100% with state 'on'.. If you use Nodeutil.exe or some other tool to look at raw data, the 2-byte hexadecimal value for SNVT_switch on at 100% will be C8 01. The C8 is a decimal 200 - percentages are 0.5% per bit (or scaled x2).

Article ID: 14 Created On: Wed, Sep 3, 2014 at 8:50 PM Last Updated On: Wed, Nov 18, 2015 at 4:16 PM