# S2N2D Gateway

Johnson Controls Metasys / Douglas Power WRS-2224 Lighting Scanner Interface

Introduction

The S2N2 Gateway is a microprocessor-based interface that bridges the connection between the Johnson Controls N2 Network Bus (N2 Bus) and the Douglas Power WRS-2224 Lighting Scanner Network Bus (DP Bus). This device allows Douglas Power WRS-2224 Lighting Scanners (with the WR-ASCII Network Module) to be controlled (individual relays and groups/zones) by the Johnson Controls Metasys system.
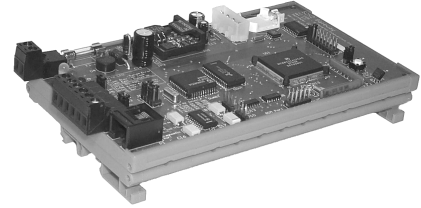
Connection

The S2N2 Gateway is connected to both the N2 and DP busses with separate connections to each. The S2N2 Gateway appears as a slave to the N2 Bus (N2 VND Device), and simultaneously appears as a master to the DP bus. The actual Douglas Power Lighting Scanners appear as N2 bus slaves to the N2 Bus through the S2N2 gateway. The N2 Addresses of the DP Scanners are the mapped to the addresses selected on the DP WR-ASCII Network Module.

The Douglas Power Scanner's relays and groups/zones appear as Binary Input and Binary Output objects to the Johnson Controls Metasys system. The Johnson Controls Metasys Point Map of the system is given on the following page.

Specifications

Part Number:	S2N2D
Power requirements:	18 – 24 VAC 60 Hz @ 200 mA (Maximum)
Environment:	
Temperature	0 C to +70 C
Humidity	10 – 95 % RH (non-condensing)
Dimensions:	7.44"L x 3.94"W x 1.75" H
	18.9cm L x 10.0cm W x 4.4cm H
Packaging:	DIN Rail Mountable
Data Interfaces:	
Johnson Controls N2 Bus:	Half-Duplex RS-485

The S2N2 Gateway loading to the Johnson Controls N2 bus is ¼ unit-load, therefore the maximum S2N2 Gateways that can be connected to the N2 Bus is 127.

Douglas Power Network Bus:	Half-Duplex RS-485

One (1) Douglas Power WR-ASCII network module is required for each Douglas Power WRS-2224 Lighting Scanner

The Douglas Power Network Interfaces (WR-ASCII) are designed with a 1 unit-load and with passive RS-485 bus biasing; therefore the maximum Douglas Power Scanners that can be connected to the S2N2 Gateway is 15.

Douglas Power Scanner Network Interfaces should be configured to 9600 Baud and *Data Acknowledge Disabled*.

Johnson Controls Metasys Point Map

Point Type	Point Address	Units	Description	Range/Value
BI	1	On/Off	Relay 1 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	2	On/Off	Relay 2 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	3	On/Off	Relay 3 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	4	On/Off	Relay 4 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	5	On/Off	Relay 5 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	6	On/Off	Relay 6 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	7	On/Off	Relay 7 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	8	On/Off	Relay 8 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	9	On/Off	Relay 9 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	10	On/Off	Relay 10 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	11	On/Off	Relay 11 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	12	On/Off	Relay 12 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	13	On/Off	Relay 13 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	14	On/Off	Relay 14 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	15	On/Off	Relay 15 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	16	On/Off	Relay 16 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	17	On/Off	Relay 17 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	18	On/Off	Relay 18 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	19	On/Off	Relay 19 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	20	On/Off	Relay 20 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	21	On/Off	Relay 21 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	22	On/Off	Relay 22 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	23	On/Off	Relay 23 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	24	On/Off	Relay 24 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	31	On/Off	Group 1 Status	0 - Off 1 - On
BI	32	On/Off	Group 2 Status	0 - Off 1 - On
BI	33	On/Off	Group 3 Status	0 - Off 1 - On
BI	34	On/Off	Group 4 Status	0 - Off 1 - On
BI	35	On/Off	Group 5 Status	0 - Off 1 - On
BO	1	On/Off	Relay 1 Status	0 – Off 1 – On
BO	2	On/Off	Relay 2 Status	0 – Off 1 - On
BO	3	On/Off	Relay 3 Status	0 – Off 1 – On
BO	4	On/Off	Relay 4 Status	0 – Off 1 - On
BO	5	On/Off	Relay 5 Status	0 – Off 1 – On
BO	6	On/Off	Relay 6 Status	0 – Off 1 - On
BO	7	On/Off	Relay 7 Status	0 – Off 1 – On
BO	8	On/Off	Relay 8 Status	0 – Off 1 - On
BO	9	On/Off	Relay 9 Status	0 – Off 1 – On
BO	10	On/Off	Relay 10 Status	0 – Off 1 - On
BO	11	On/Off	Relay 11 Status	0 – Off 1 – On
BO	12	On/Off	Relay 12 Status	0 – Off 1 - On
BO	13	On/Off	Relay 13 Status	0 – Off 1 – On
BO	14	On/Off	Relay 14 Status	0 – Off 1 - On
BO	15	On/Off	Relay 15 Status	0 – Off 1 – On
BO	16	On/Off	Relay 16 Status	0 – Off 1 - On
BO	17	On/Off	Relay 17 Status	0 – Off 1 – On
BO	18	On/Off	Relay 18 Status	0 – Off 1 - On
BO	19	On/Off	Relay 19 Status	0 – Off 1 – On
BO	20	On/Off	Relay 20 Status	0 – Off 1 - On
BO	21	On/Off	Relay 21 Status	0 – Off 1 – On
BO	22	On/Off	Relay 22 Status	0 – Off 1 - On
BO	23	On/Off	Relay 23 Status	0 – Off 1 – On
BO	24	On/Off	Relay 24 Status	0 – Off 1 - On
BO	31	On/Off	Group 1 Status	0 - Off 1 - On
BO	32	On/Off	Group 2 Status	0 - Off 1 - On
BO	33	On/Off	Group 3 Status	0 - Off 1 - On
BO	34	On/Off	Group 4 Status	0 - Off 1 - On
BO	35	On/Off	Group 5 Status	0 - Off 1 - On

Electrical Interface

Voltage:	16-24 VAC 60 Hz
Current:	150 mA AC (Estimated)

Data Interface

Metasys:	RS-485 Half Duplex (N2 Bus)
Douglas Power:	RS-485 Half Duplex

To map the Douglas Power scanners into the Metasys system, each scanner will have its own unique Device ID number $(1 – 255)$[1]. The S2N2 gateway is configured with these IDs so as to translate[2] the data to/from the Douglas Power Scanners from/to the Metasys system.

Note:

1. The S2N2 Gateway loading to the Johnson Controls N2 bus is ¼ unit load. Thus the maximum S2N2 Gateways that can be connected to the N2 Bus is 127.

2. The Douglas Power scanners are designed with a 1 unit – load RS-485 bus loading and with passive RS-485 bus biasing. Thus, the maximum number of Douglas Power Scanners (via WR-ASCII Modules) that can be connected to the S2N2 Gateway is 15.

3. The communication rate for both interfaces is hard-coded to 9600 Baud, 8 Data Bits, No parity, and 1 stop bit.

4. Douglas Power scanners must be configured with **Data Acknowledge Disabled**.

PC Configuration Software – S2N2

Windows 95/98/NT

Configures the S2N2 Gateway's ID and also the Douglas Power Scanner poll rate.

Tests (turn relay on/off), programs (group programming) and archiving (saving of group programming) of the connected Douglas Power scanners.

Johnson Controls Metasys System Control

On and Off of any relay output

Status report of relay ON/OFF/Connected state

Actuate any of the 5 master inputs

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[1] ID 0 is not used as this is a privileged ID within the Johnson Controls N2 bus specification

[2] The S2N2 gateway physically (not electrically) isolates the N2 bus from the Douglas Power Scanner bus.

Supported Command Sets

Metasys N2[3,4]

   Poll Without/With Ack Message
        Binary Input/Output COS[5] Response Only

        No COS Poll Response

   Warm Start
   Status Update
   Read Binary Input
   Read Binary Output
   Write Binary Input
   Write Binary Output
   Override Binary Input (Request Change of State)
   Override Binary Output (Request Change of State)
   Override Release (No Function)
   Identify Device Type

Douglas Power (Command Set Supported)

   nviProgram   Program
   nviActivate   Activate Relay
   nviGroup   Set Group
   nviFlick   Set Flick
   nvoProduct   Query Product Info
   nvoGroup   Query Active groups
   nvoFlick   Query Flick Code
   nvoRelays   Query Relay Status
   nvoProgram   Query Program

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[3] Due to the nature of the Douglas Power Scanners, Metasys sees the Douglas Power Scanners as binary input / output objects.
[4] As described in **Metasys N2 System Protocol Specification (For Vendors)** dated 6/13/96, authored by Johnson Controls.
[5] COS is an acronym for Change Of State.

Basic Operation

We assume that all the Douglas Power Scanners have been properly addressed, baud rates set, and Data Acknowledge disabled.

Connect the S2N2 Gateway to the Johnson Controls NCU N2 bus and also to the Douglas Power Scanners' Bus.

Execute the S2N2 Gateway Configuration software and configure the serial port of the computer. This is the port that is connected to the Gateway with the proprietary cable. To change the serial port settings, execute:

Action – Settings - Serial Port

You should see a dialog box like the one shown in Figure 1. You will not be able to change the Parity, Data Bits, Stop Bits, or the Baud rate, as these parameters are hard-coded within the Gateway.
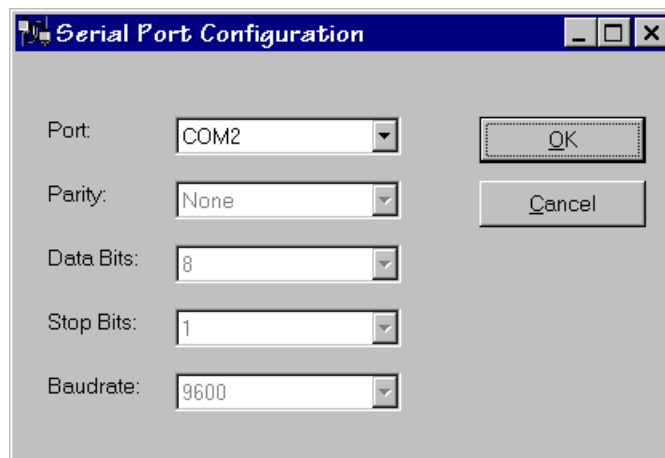
Figure 1 – Serial Port Configuration Dialog Box

Now, attach the proprietary cable to the Gateway, and execute:

Action – S2N2 Gateway – Gateway Connect

A dialog box should come up indicating that it has found the Gateway and it displays the current date and revision of the Gateway firmware. If not, then check your serial port connections and configurations.

To configure the Gateway's Device ID (as seen by the NCU) and the scanner poll rate, execute:

Action – S2N2 Gateway – Configure Gateway

You should see a dialog box like the one shown in Figure 2. The "Gateway Parameters" section contains parameters that will be programmed into the Gateway.

The "Software Parameters" section contains parameters that are specific to the operation of the S2N2 Gateway Configuration software only (these parameters do not affect the actual S2N2 Gateway). In particular, one can set the minimum and maximum Scanners to look for by the software. Further, the

Scanner response time is a value that determines how long the software will wait for data to be returned from the scanner.

Once you have changed any of the data values, press the "Update" button. This button must be pressed in order for the changes to take effect. If any of the Gateway Parameters have been modified, then a "Programming" Dialog Box will appear indicating that the Gateway is being programmed. Once the status bar within this dialog box finishes, you can re-connect to the Gateway.

Figure 2 – Configure Gateway Dialog Box

Resetting the Gateway

When the Gateway's Reset Button (S1) is pressed, the Gateway creates a dynamic database of all found scanners. If a scanner is not found, the Gateway will not poll for this scanner, nor will the NCU (or Metasys) see this scanner.

Pressing the Gateway's Reset Button (S1) can be done at any time. In fact, if additional scanners are connected to the system, the Reset Button must be pressed, or the Gateway should be powered-down, then up.

If a scanner has been removed from the system, the system will attempt to poll the scanner every poll sequence. This degrades system performance, as the Gateway re-sends the poll sequence several times before it continues to poll the next scanner. If a scanner is to be removed for a long period of time, then the Reset Button (S1) should be pressed, so as remove this scanner from the Gateway's dynamic database.

Please note that during the Gateway's Reset Sequence, the NCU (and Metasys) will not be able to access the attached Scanners.

S2N2 Gateway Hardware Configuration

Referring to the S2N2 Gateway Silkscreen, the following explains the device's jumpers and connectors.

Designator	Description
F1	Fuse 1A – 250 V
JP2	Power Supply Input 16 - 24VAC/DC
JP5	Johnson Controls N2 Bus Termination – Short = Termination ON
JP6	Douglas Power Scanner Bus Termination – Must be Shorted
JP12: 1 – 2	System Jumper – Must be Shorted
JP12: 3 – 4	System Jumper – Must be Open
JP12: 5 – 6	System Jumper – Must be Shorted
JP12: 7 – 8	System Jumper – Must be Open
JP13-Pin 1	Johnson Controls N2+ (RS-485 Positive)
JP13-Pin 2	Johnson Controls N2- (RS-485 Negative)
JP13-Pin 3	Johnson Controls Ref
JP13-Pin 4	Douglas Power Scanner 485+
JP13-Pin 5	Douglas Power Scanner 485-
JP13-Pin 6	Douglas Power Ground
JP14	System BDM Port – No jumpers leave open
JP16: 1 – 2	System Jumper – Must be Shorted
JP17: 1 – 2	System Jumper – Must be Shorted
P1	User Diagnostic Port – (RS-232 Serial Port)
S1	System Reset Button
D1	Amber LED – Power Supply Connected
D2	Green LED - +5 Volts Supply Present
D3	Red LED – System Alive Indicator
	Steady ON/Off – System Failure
	Slow Flash – Alive, but no communication with NCU
	Rapid Flash – Alive and communication with NCU

24VAC Max

JP2

Vin Present
+5V Present
Alive

D1
D2
D3

JP13

Silk Top   Outline

Diag Port
P1

8 7 6 5 4 3 2 1
Tern   Tern   Tern
R25 JP15 R4 JP6 R3 JP5
U14   U4   U3

C18 C17

JP12

RS-232
U2

X1

JP13 RS-485
1:D1 A/N2+
2:D1 B/N2-
3:D1 Ref
4:D12 A/N2+
5:D12 B/N2-
6:D12 Ref

Alive LED
Q14
Flash Slow - System Error
Flash Fast - No Conn
On - System OK

D4
990M
FL1

C14

Vin
GND
JP3

D7   D8

PT5101A

U1

C13   C12

D6
JP4
+3V

X3

U12

B1

S1   RESET*

JP7

P2
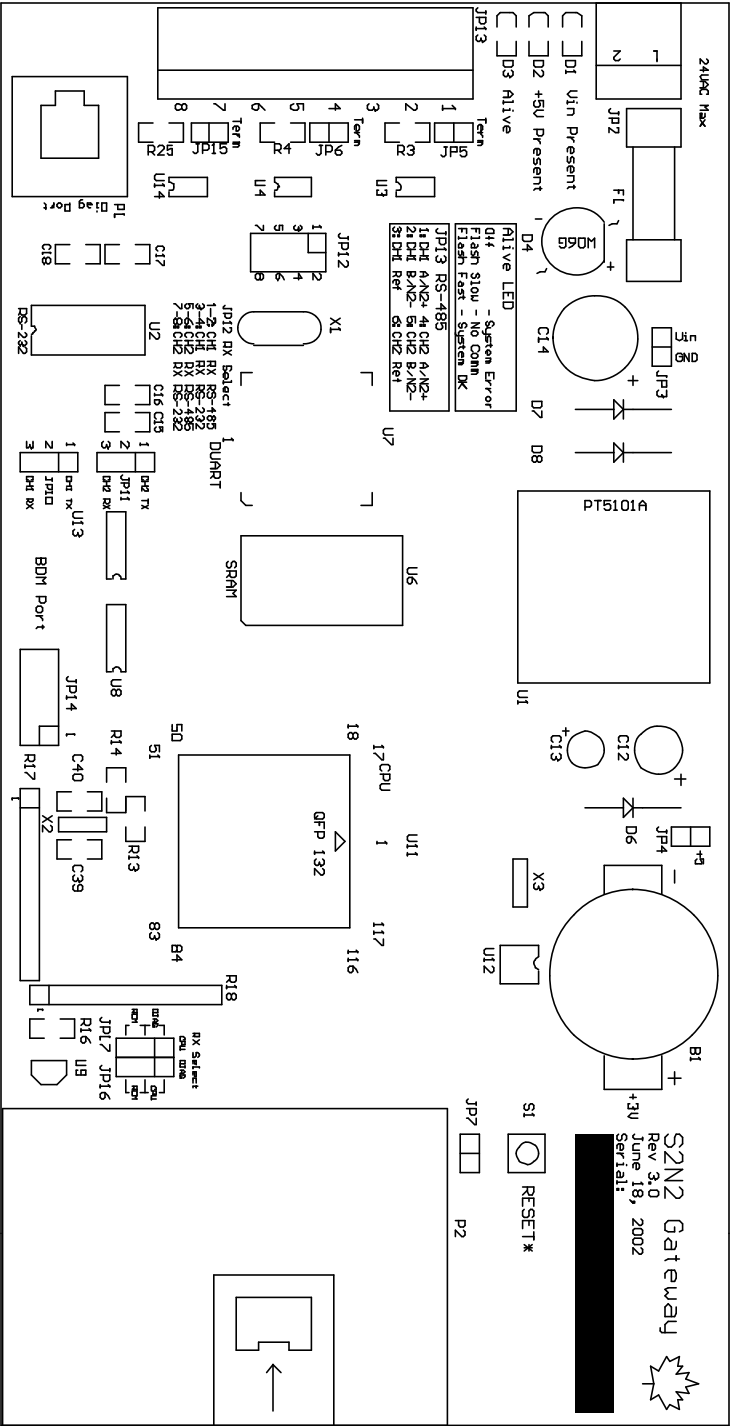
S2N2 Gateway
Rev 3.0
June 18, 2002
Serial:

C16 C15
DUART

JP12 RX Select
1-2 CH1 RX RS-485
3-4 CH1 RX RS-232
5-6 CH2 RX RS-485
7-8 CH2 RX RS-232

JP11
U13
BDM Port

QFP 132
U11
CPU
18
17
1
117
116
50
51
83
84

SRAM
U6

U8
JP14
R17
R14 C40
X2
C39 R13
R18

RX Select
JP17 JP16
R16
U9
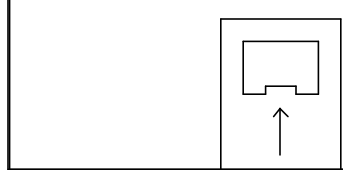
Johnson Controls S2N2 Gateway Point Map

The point map of the Gateway and the associated Douglas Power Scanner Relays and Group objects are mapped to both Binary Output (BO) and Binary Input (BI) objects.

As of May 14, 1999, the BO objects exhibit strange behavior in regards to how Metasys interprets their Changes-Of-State (COS)[6]. Thus, it became necessary to configure the Gateway so that the any COSs (other than the initial configuration BO COS) from the Scanner Relays/Groups be reflected as BI COSs. In essence the BO is commanded to whatever state is desired (On or Off), but the COSs will be reflected as BI COSs.

One additional item to document is that the point map has a "hole" in it. The Douglas Power Scanners have 24 relays and 5 groups defined. To facilitate easier Metasys programming, the Relays are mapped from Point Addresses 1 to 24 for Relays 1 to 24 respectively, and the Groups are mapped from Addresses 31 to 35 for Groups 1 to 5 respectively (please refer to figure 3).

Point Type	Point Address	Units	Description	Range/Value
BI	1	On/Off	Relay 1 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	2	On/Off	Relay 2 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	3	On/Off	Relay 3 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	4	On/Off	Relay 4 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	5	On/Off	Relay 5 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	6	On/Off	Relay 6 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	7	On/Off	Relay 7 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	8	On/Off	Relay 8 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	9	On/Off	Relay 9 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	10	On/Off	Relay 10 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	11	On/Off	Relay 11 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	12	On/Off	Relay 12 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	13	On/Off	Relay 13 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	14	On/Off	Relay 14 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	15	On/Off	Relay 15 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	16	On/Off	Relay 16 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	17	On/Off	Relay 17 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	18	On/Off	Relay 18 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	19	On/Off	Relay 19 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	20	On/Off	Relay 20 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	21	On/Off	Relay 21 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	22	On/Off	Relay 22 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	23	On/Off	Relay 23 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault
BI	24	On/Off	Relay 24 Status	0 – Off 1 – On Unreliable – Absent Trouble - Fault

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[6] Metasys periodically ignores Binary Object (BO) Changes of State (COS).

BI	31	On/Off	Group 1 Status	0 - Off 1 - On
BI	32	On/Off	Group 2 Status	0 - Off 1 - On
BI	33	On/Off	Group 3 Status	0 - Off 1 - On
BI	34	On/Off	Group 4 Status	0 - Off 1 - On
BI	35	On/Off	Group 5 Status	0 - Off 1 - On
BO	1	On/Off	Relay 1 Status	0 – Off 1 – On
BO	2	On/Off	Relay 2 Status	0 – Off 1 - On
BO	3	On/Off	Relay 3 Status	0 – Off 1 – On
BO	4	On/Off	Relay 4 Status	0 – Off 1 - On
BO	5	On/Off	Relay 5 Status	0 – Off 1 – On
BO	6	On/Off	Relay 6 Status	0 – Off 1 - On
BO	7	On/Off	Relay 7 Status	0 – Off 1 – On
BO	8	On/Off	Relay 8 Status	0 – Off 1 - On
BO	9	On/Off	Relay 9 Status	0 – Off 1 – On
BO	10	On/Off	Relay 10 Status	0 – Off 1 - On
BO	11	On/Off	Relay 11 Status	0 – Off 1 – On
BO	12	On/Off	Relay 12 Status	0 – Off 1 - On
BO	13	On/Off	Relay 13 Status	0 – Off 1 – On
BO	14	On/Off	Relay 14 Status	0 – Off 1 - On
BO	15	On/Off	Relay 15 Status	0 – Off 1 – On
BO	16	On/Off	Relay 16 Status	0 – Off 1 - On
BO	17	On/Off	Relay 17 Status	0 – Off 1 – On
BO	18	On/Off	Relay 18 Status	0 – Off 1 - On
BO	19	On/Off	Relay 19 Status	0 – Off 1 – On
BO	20	On/Off	Relay 20 Status	0 – Off 1 - On
BO	21	On/Off	Relay 21 Status	0 – Off 1 – On
BO	22	On/Off	Relay 22 Status	0 – Off 1 - On
BO	23	On/Off	Relay 23 Status	0 – Off 1 – On
BO	24	On/Off	Relay 24 Status	0 – Off 1 - On
BO	31	On/Off	Group 1 Status	0 - Off 1 - On
BO	32	On/Off	Group 2 Status	0 - Off 1 - On
BO	33	On/Off	Group 3 Status	0 - Off 1 - On
BO	34	On/Off	Group 4 Status	0 - Off 1 - On
BO	35	On/Off	Group 5 Status	0 - Off 1 - On

Figure 3 – S2N2 Gateway Point Map

S2N2D Key Points August 2002

The following is a list of a few of the key points to consider:

a. When connecting the WR-ASCII to the WRS-2224, ensure that the WRS-2224 power is disconnected.

b. The Douglas Network Module, WR-ASCII, must be configured (dip switches) for 9600 baud and "Data Acknowledge Disabled"

> Baud Rate and ACK Settings (4 position DIP switch)
> (Read as Left to Right)
> SW   1   2   3   4
>   down - down - up - down

c. It is important to have the termination switches or jumpers set correctly. The Gateway should always have jumper JP6 installed. The last Douglas Network Module/Scanner on the Douglas Bus must have the termination switch set to ON. All other Douglas modules must have their terminations set to OFF.

d. The gateway itself occupies a N2 address, but does not have any points for you to control and/or monitor. If occupies an address so that the operator knows that something is connected to the N2 Bus.

e. The Device address as set on the Douglas WR-ASCII Module will be the N2 Address as seen by Metasys (via the Gateway).

f. At any time should you change the Douglas device address, you will need to reset or power-down the Gateway. This is very important, as it is during the Gateway's reset sequence that the gateway dynamically creates a Metasys database of the found Douglas devices

g. Within Metasys, you configure the Gateway and the subsequent Douglas Scanners as N2 Devices of type VND

h. Metasys can control any relay and/or group on the scanner just like one of the field devices (switch, photocell, etc)

i. Any field devices (local switch, time clock, photocell, etc) connected in conjunction to a relay will always have the ability to control the relay. This does not mean that any one field device (including Metasys) overrides the relay's state. i.e. If Metasys changes a relay's state (on/off) and a field device has been triggered (someone pushes a wall switch, or the photocell becomes triggered, etc), the relay will be commanded to the state by the last trigger.

j. Any relay as part of a group can be controlled by the relay point itself (BO 1 - 24) or via the Group (BO 31-35). Remembering that the programmable nature of the Douglas Groups may cause unexpected relay behavior. i.e. you may program Metasys to control Relay X, but Relay X is part of Group Y. Thus, Metasys triggers Relay X to off, but sometime later group Y is triggered to turn on, which makes Relay X turn on...

k. The Douglas Power WR-ASCII's RS-485 interface limits the number of attached Douglas devices to the Gateway to fifteen (15).