S2N2E Configuration Procedure

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S2N2E Configuration Procedure

1. Overview

The S2N2E Configuration program, S2N2EConfig.exe, is a Windows 2000 and XP supported application. Its function is to configure the S2N2E Ethernet Gateway, update the gateway's operating program, and to allow the user to perform some basic diagnostics.

2. Setup

a.   Installation of the S2N2EConfig starts with running setup.exe from the installation CD.

b.   After the application has been installed, run the S2N2EConfig.exe program

c.   Go to Action-Application Settings-Serial Port Menu item

d.   Here you will be able to set the Serial Port for Serial Access to the S2N2E Gateway. Selecting the appropriate COM port and pressing "OK" will save the information.

e.   Setup is now complete.

3. Gateway Configuration

The S2N2E must be configured for either a Master (Ethernet Master, N2 Slave) or a Slave (Ethernet Slave, N2 Master). Moving the mouse to the Left Pane (the one displaying Not Connected) and pressing the right mouse button will allow you to select the functionality of the gateway (Master or Slave).

3.1 Master Configuration

As a "Master" you must list all of the "Slave" Gateways and all of the remote N2 field devices that the Master is to communicate with. It is this list (configuration) that instructs the Master as to what devices it must respond to on its local N2 bus. Further, any duplication of IP or N2 addresses will result in inconsistent and erratic operation. It is imperative that this data be correct.

Right-mouse clicking and selecting "Add a Master" will display the network configuration for the Master.

Gateway Master Setup Wizard

S2N2E Gateway Master Definition Setup
Please supply the following S2N2 Gateway Master information

N2 Device ID:	001 ▼	Decimal	01 ▼	Hex
Local IP:	000	000	000	000
Netmask:	000	000	000	000
Gateway:	000	000	000	000

[Finished] [Cancel]

Here, you must enter the Master Gateway's N2 Address and its Ethernet network information (IP address, Network Mask, and Network Gateway). The N2 Device ID is listed in both decimal and in hexadecimal formats. Entering data into either field will convert the other field accordingly. Once the information has been entered, pressing "Finished" will save the information and display a screen similar to the following:
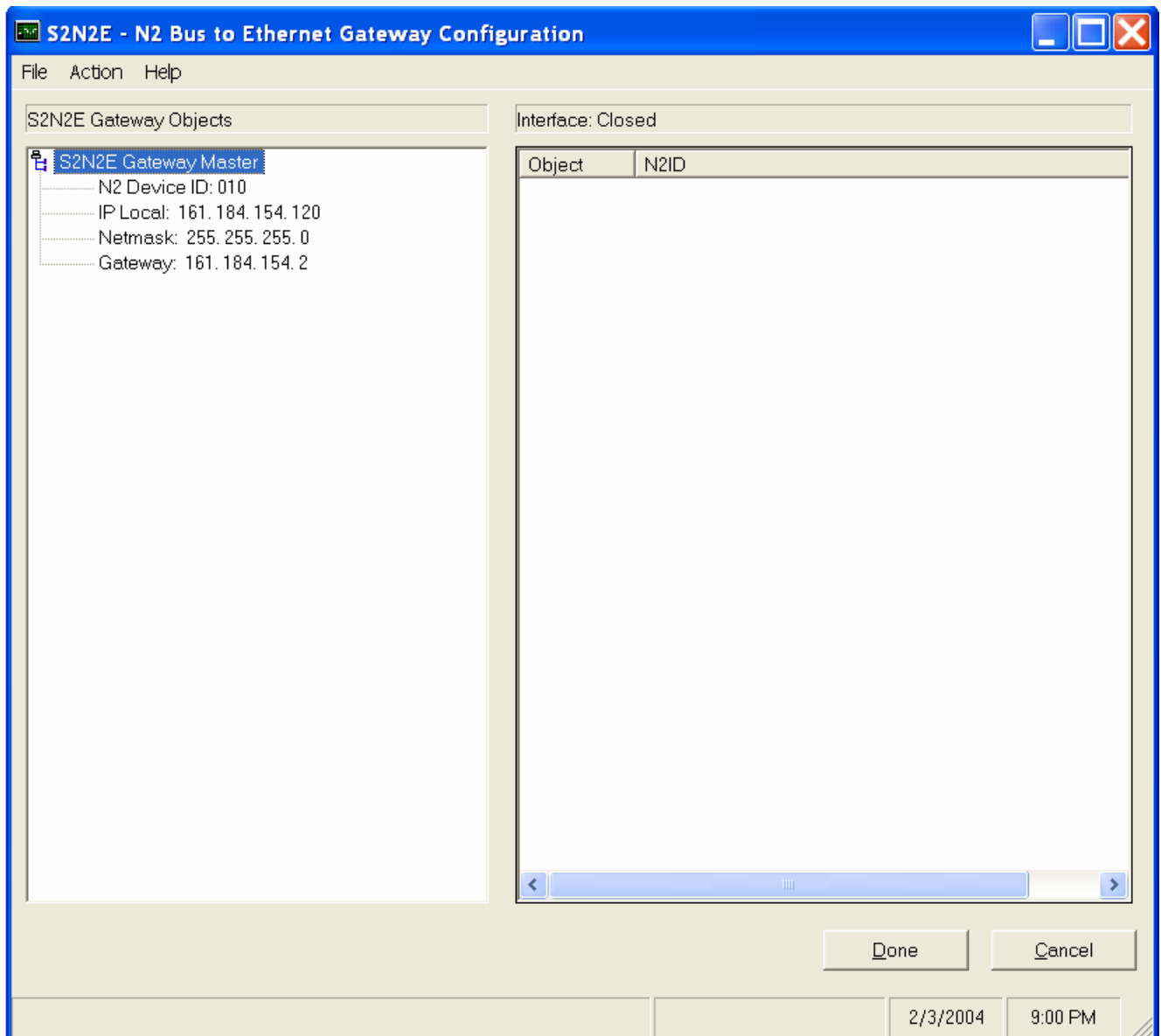
Right-mouse clicking in the left pane will allow you to edit the Master information, or you can "Add a Slave Device". Editing the Master information will take you back to the previous screen so that you can adjust any of the master gateway's parameters.

Adding a slave will display a Network configuration dialog similar to that of the Master, except that an additional non-editable field will be displayed (Master's IP Address). Remember that the Slave Gateways will only communicate with designated Master Gateways. Here the designation is the Master's IP Address.

Adding the N2 device ID and the Network information is the same as the Master's.
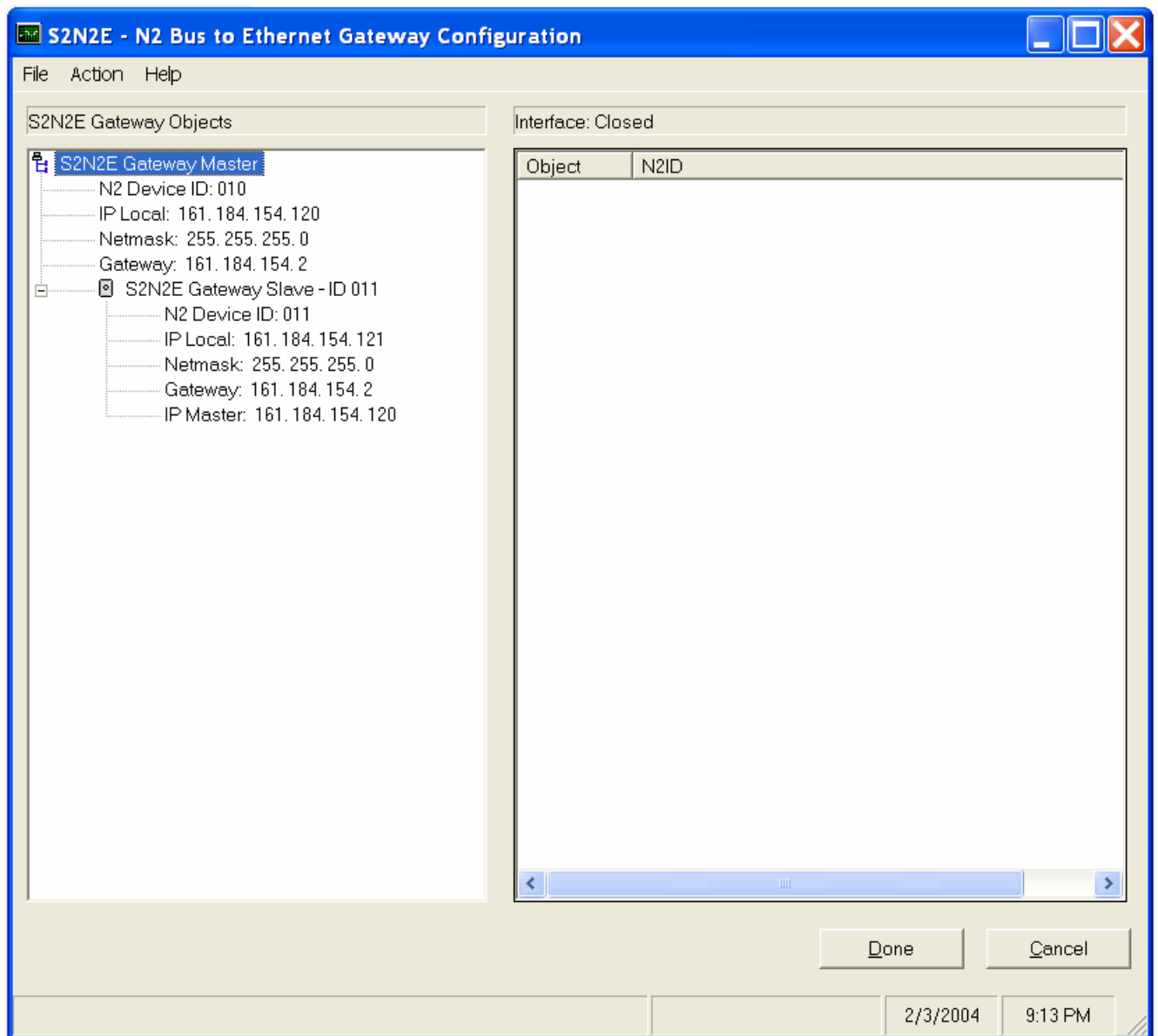
Right-mouse clicking within the left pane has some differences depending upon where you are clicking. Selecting any items in the Master Area will allow editing of the Master data or adding another Slave Gateway. Clicking in the Slave area, will allow for editing of the Slave gateway data, deleting the Slave Gateway, or adding/deleting the Slave Gateway's N2 Devices.

Adding additional Slave Gateways is the same as above: left-mouse click in the Master Area, right-mouse click and select "Add Slave Gateway". Remember, you are limited to ten (10) Slave Gateways per Master.

Adding N2 Field Devices is very similar to adding Slave Gateways. The difference is that you must left-mouse click on the desired Slave Gateway (the one where the N2 Device is to be connected), and right-mouse click to reveal your choices. Selecting "Add N2 Device" will display the following dialog:

Again, the N2 Device ID will need to be entered and also what type of device it is. The supported device list is expanding and will reflect the current supported N2 device. Once this information is complete, pressing "Finished" will save the information. Now, you will see something like the following:
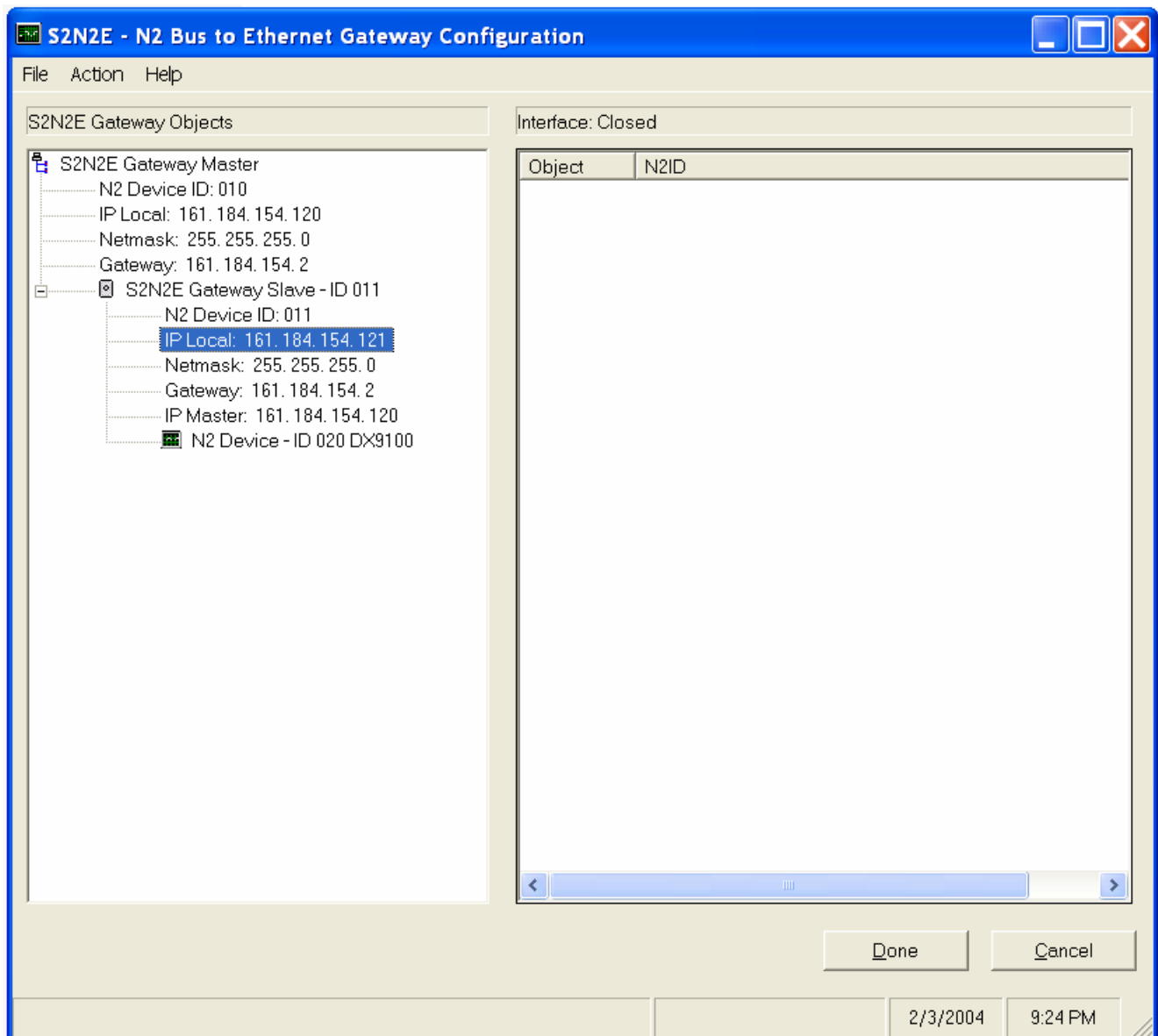
You can add more N2 Devices to the Slave Gateway by following the same procedure. Please remember that you are limited to three (3) N2 devices for each Slave Gateway.

That is all it takes. Transversing the "Gateway" Tree and right-mouse clicking will reveal what options are available to you.

After you are satisfied with the configuration, it is best to save the file for future use. Selecting File-Save from the Menu will reveal the standard Windows File Save Dialog. Conversely, retrieving a saved configuration is simply File-Open.

3.2 Slave Configuration

Creating a Slave configuration is very similar to that of a Master. The difference is that you can only add one (1) Slave Gateway and up to three (3) N2 devices. Further, you must enter the Master's IP Address into the Slave Gateway's Network information. This is very important, as the Slave Gateway will not communicate with any other devices except the one with this IP Address.

Since the Slave Gateway configuration is so similar to that of the Master, the user is directed to review the Master Gateway's procedure.

4. Updating the Gateway's Configuration

The Gateway can have its configuration updated in two ways. The first method is via the serial port and the supplied S2N2E Diagnostic/Configuration cable. The second method is via the Ethernet Network.

4.1 Serial Update

The Serial port method is used in the initial configuration of the Gateway, as the current Gateway network information may not be correct for the user's network. The serial port method can be used at any time that the user can connected the S2N2E cable to the gateway.

To ensure that communication has been established and all is in order, it is suggested that the following be done.

a. Ensure that a valid configuration is displayed

b. Ensure that **Action-Application Settings-Communication-Serial Port** is Checked.

c. Verify Serial Communication by selecting **Action-Gateway-MAC Address-Retrieve**. Here the Gateway's MAC address will be displayed. If not, then you have a problem with your serial port, S2N2E Cable, or the gateway itself.

d. Assuming that the above is successful, then selecting **Action-Gateway-Configuration-Update**, and selecting "yes" will update the Gateway's configuration. A confirmation message will be displayed indicating that the configuration has been saved. If not, then there is a problem. Try the procedure again and ensure that the S2N2E cable is correctly connected.

e. Assuming that the above was successful, the Gateway will need to be re-booted for the new configuration to take effect. To do this, the user can press the reset button on the Gateway, or can force a reboot by selecting **Action-Gateway-Reboot-Hard**. This forces a full reboot (RAM test, etc).

f. Wait until the Gateway's Alive light is flashing, and confirm that the configuration has been saved by selecting **Action-Gateway-Configuration-Retrieve**. Here, the configuration will be displayed and should be inspected to ensure that all is in order.

g. The Gateway is now configured.

4.2 Network Update

The Network method is used in situations where the Gateway is already functioning (i.e. network information is already correct). The Network method can update the Gateway anywhere within the network. Depending upon how extensive the network is structured, this could mean across the hall or across the World.

To communicate via the Network, a procedure must be followed, as the Gateways are not designed to respond the network devices not explicitly defined. S Squared has devised the following authentication sequence to accommodate this security.

a. Ensure that a valid configuration is displayed.

b. Select Action**-Application Settings-Communication-Ethernet**

c. This will prompt an authentication/negotiate sequence to take place. If this is successful, a Message will be displayed indicating that the Negotiation was Successful. If this message is not displayed, try this once again, as Network routers (ARP issues) may slow the procedure. A Successful message must be displayed before you can continue.

d. Assuming you have successfully negotiated a connection, you can continue. However, this connection will only be available for approx 10 minutes. After which time the connection is closed and a negotiation sequence must be redone (**Action-Application Settings-Communication-Ethernet Negotiate**).

e. As in the serial case, ensure all is well by retrieving the Gateway's MAC address. -**Gateway-MAC Address-Retrieve**

f. Now, following is the same as the serial procedure.

g. Assuming that the above is successful, then selecting **Action-Gateway-Configuration-Update**, and selecting "yes" will update the Gateway's configuration. A confirmation message will be displayed indicating that the configuration has been saved. If not, then there is a problem. Try the procedure again and ensure that the S2N2E cable is correctly connected.

h. Assuming that the above was successful, the Gateway will need to be re-booted for the new configuration to take effect. To do this, the user can press the reset button on the Gateway, or can force a reboot by selecting **Action-Gateway-Reboot-Hard**. This forces a full reboot (RAM test, etc).

i. Once the device has been rebooted, the Negotiate Sequence must be redone, as the reboot closed the connection. Wait until the Gateway's Alive light is flashing and then select **Action-Application Settings-Communication-Ethernet Negotiate.**

j. Confirm that the configuration has been saved by selecting **Action-Gateway-Configuration-Retrieve**. Here, the configuration will be displayed and should be inspected to ensure that all is in order.

k. The Gateway is now configured.

5. Diagnostic Commands

There are a variety of diagnostic commands that are embedded within the gateway. Most of these commands will not be documented, as indiscriminate use could render the Gateway unusable. If this happens, the Gateway must be returned to the factory for in-house restoration.

5.1 Ping Command

However, in order to accommodate the user with some basic testing, a "Ping" command is available (**Action-Gateway-Ping**).

The S2N2 Gateways are network devices and as such are subject to malicious network communication (Denial Of Service attacks, network probes, network port scans, etc). Thus, in order to combat these issues and remain in operation a variety of security measures have been taken. First and foremost, the S2N2 Gateway cannot be seen on the network by traditional methods (pings, port scans, etc). Malicious users and/or applications cannot attack devices that do not exist, or *do not appear* to exist. What this means, is that a standard "ping" request will go unanswered, as this is the simplest method for detecting a device on a network. Unfortunately disabling a "ping" response means that legitimate users cannot ensure a valid network connection. To accommodate a legitimate user, the S2N2EConfig program has a special "Ping" function that will instruct the Gateway to respond.

The S2N2 Ping Dialog has several Functions: Standard Ping, S Squared Ping, Ping Reboot Soft, and Ping Reboot Hard.
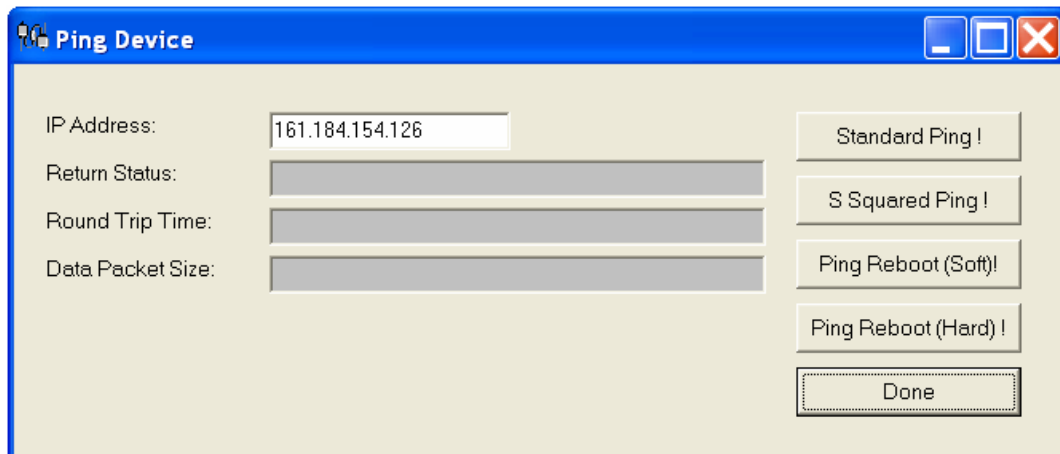
Standard Ping – Sends a typical Ping to any device. Sending this type of ping will result in no response from the Gateway.

S Squared Ping – Sends a special Ping Sequence that instructs the Gateway to respond.

Ping Reboot Soft – Sends a special Ping Sequence that instructs the Gateway to soft reboot.

Ping Reboot Hard – Sends a special Ping Sequence that instructs the Gateway to Hard Reboot.

The last time commands are used in the event that the Gateway has somehow gone offline and does not respond to a negotiate sequence. It is hopeful attempt that Gateway is still functioning at a low level and that a reboot is required to re-initialize the system.

To send any of the commands, the user must enter a valid IP address in the First field. This is the only field that the user can enter any information. The IP address is not limited to the gateway, but can be any network address.

Sending the other Ping commands to non S2N2E Gateway devices will not harm them in any way. In fact, all other devices will respond to those pings.

Upon entering this dialog, the default IP Address will be that of the Gateway located in the configuration pane.

5.2 Ethernet Messages (Unsupported Command)

The last command is one that is not within the S2N2Config program. The S2N2EConfig.exe program is closed, and a dumb terminal program (Hyperterminal or equivalent) is used. Using the S2N2E Cable and connecting it to the computer's serial port will allow the user to see the Ethernet messages between the Master and Slave gateways. This tells the user that Ethernet communication has been established and is ongoing. To view these messages, the dumb terminal program must be set to 19200 Baud, No Parity, 8 Data Bits, 1 stop bits, and Flow Control set to None. At the dumb terminal, pressing the Enter button will display the S2N2E> prompt. Here entering "emsg" and pressing enter will display the Ethernet messages. Entering "emsg" and Enter will stop the messages. Stopping the displaying of Ethernet messages is necessary, as leaving this enabled will significantly affect performance of the Gateway.

These Ethernet messages can be captured and reviewed by S Squared personnel. Since this command is unsupported, a detailed explanation of the Ethernet Packets or its contents will not be given.

S2N2E Rev 1 or 2 Wiring Diagram

S2N2E - Rev 3.0 PCB

Power

N2+
N2-
Ref

USB

LED Receive

Ethernet

Link LED

2A Max

680

Power

Alive

Tx

Rx

Diag

Bus Bias - Pull Up Enable

Bus Termination Enable

Bus Bias - Pull Down Enable

PullUp

Term

PullDn

S2N2E
Rev 3.0 - 2014/07/16
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Reset
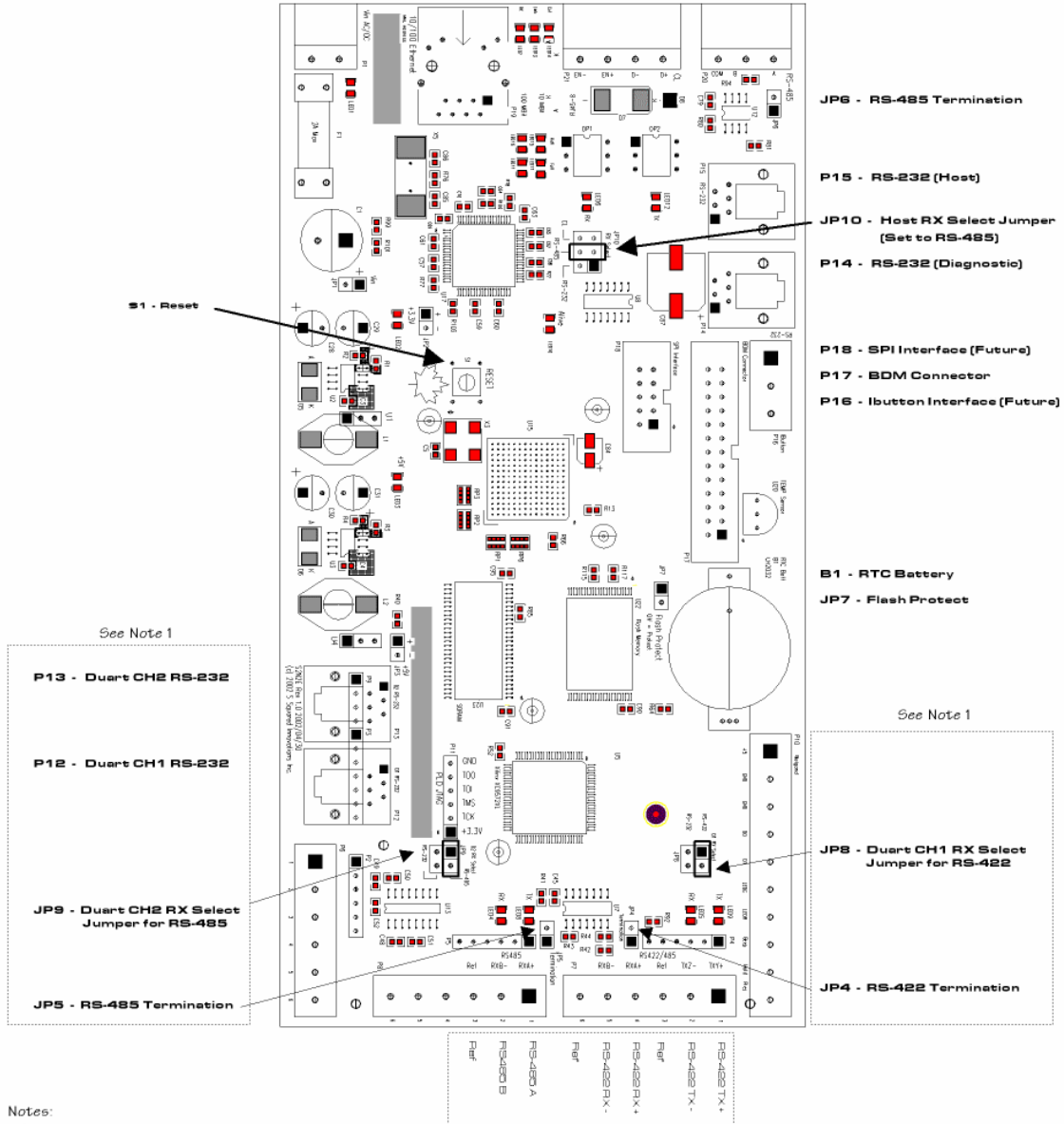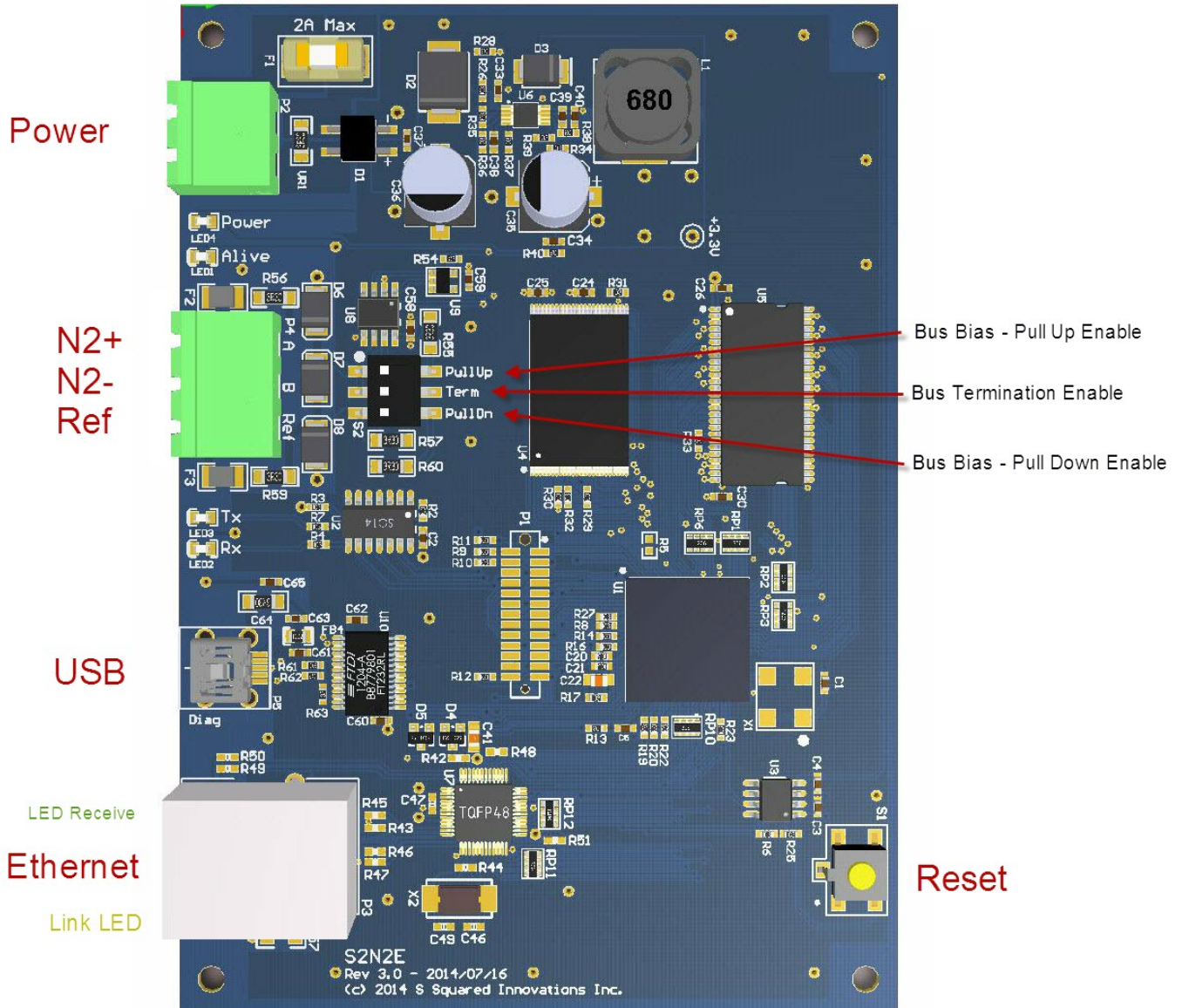
7. S2N2E Ethernet Statistics

Starting with Firmware version 2.49 and greater, the S2N2E's Ethernet statistics can be mapped and trended within the Metasys System. The following statistics are available:

AI Point	Units	Description
AI1	Milliseconds	Slave Response Time (most recent packet)
AI2	Milliseconds	Slave Response Time (maximum during time session) . This value will reset every 15 minutes.
AI3	Value	Received Packets from Slave to Master
AI4	Value	Transmitted Packets from Master to Slave
AI5	Value	Lost Packets
AI6	Value	Packet Retransmission Count
AI7	Value	Corrupted Packets (from Slave)
AI8	Value	Unprocessed Packets (from Slave)
AI9	Value	Mismatched Packets from Slave
AI10	Value	Duplicated Packets from Slave

Although these statistics are collected and administered by the S2N2E Master, they must be mapped to the S2N2E slave's N2 Address (VND Device). Consequently, each S2N2E Slave controlled by the S2N2E master will have these points available. In future firmware versions, we will include the ability to clear the stats (BO point) as well as automatically clear the Max Slave Response time value (perhaps daily, etc or as an AO value).

One other point to mention is that these points will not reflect values to change of state (COS) requests by the network controller (NCM, N30, etc). This was done so as not to burden the N2 bus with these constantly changing data. Basically, by not responding to COS requests, the S2N2E minimizes its N2 bandwidth requirement and so these values will update within Metasys approximately every 10 seconds.

One can also access these Ethernet Statistics from the Diagnostic port. The "estats" command is available and its syntax is as follows:

Syntax:
    estats [clear] | [status] | [master] | [0 -9]

    estats clear   - Clear all Stats
    estats status   - Display online/offline statuses of S2N2E Slaves
    estats master   - Display Ethernet stats of Master
    estats 0   - Display Ethernet stats of S2N2E Slave Index 0 (first slave within S2N2E Master's
                           Configuration)
    estats 1   - Display Ethernet stats of S2N2E Slave Index 1 (Second slave within S2N2E Master's
                           Configuration), etc.

8. S2N2E Network "Tuning" Variables

Starting from firmware version 2.30 dated 3/18/2005, adjustments to the Ethernet and N2 bus parameters were made available. These values are stored within the S2N2E's non-volatile memory area and as such their values are maintained even when power is removed or if the device is reset.

These parameters were made available and adjustable, as users wished the S2N2E to be connected to other JC controllers (N30, NAE, etc) that have differing N2 bus communication characteristics.

Parameters that can be changed:

Master Poll Rate ("mpr")   (in 100's of microseconds)
The rate at which the Ethernet Master polls its Ethernet Slaves.
Default value: 500 (50 milliseconds)

Master Retry Max ("mrm")   (Retry Count)
The number of times an Ethernet Master will attempt to communicate with an Ethernet Slave before the Ethernet packet is discarded.
Default value: 5

Master Wait Time ("mwt")   (in 100's of microseconds)
The number of milliseconds that the Ethernet Master will wait for a response from the Ethernet Slave
Default: 90000 (9000 milliseconds or 9 Seconds)
The default value is the maximum amount and cannot be sustained indefinitely. If packets are taking 9 seconds to return, the Ethernet network is improperly balanced and is unsuitable for reasonable Ethernet communication.

N2 Bus Poll Time ("n2pt")   (in 100's of microseconds)
The rate at which an Ethernet Slave / N2 Master polls its N2 devices for data
Default: 30000 (3000 milliseconds or 3 Seconds… Same as NCM-350)
Change this value to 2500 (250 milliseconds for NAE, etc)

Extended Offline Timer ("xoff")   (in minutes)
This sets a timer so as to allow for x minutes before a N2 device is flagged as offline
Default: 0 (after MRM tries, the device is considered offline)

Standard Ping Enable/Disable ("ping")   (1 or 0)
Determines if the S2N2E responds to standard PINGs
Default: 1 (Standard Ping Enable)

Please note that the above values in "100's of microseconds) can be converted to milliseconds by dividing the value by 10 or to seconds by dividing by 10000

Command Syntax:

    fv   [no arguments]   - Displays syntax

    fv   mpr [Value] - Adjusts Master Poll Rate
    fv   mrm   [Value] - Adjusts Master Retry Max
    fv   mwt[Value] - Adjusts Master Wait Time
    fv   N2PT   [Value] - Adjusts N2 Bus Poll Time
    fv   XOFF   [Value] - Adjusts Extended Offline Timer
    fv   Ping   [Value] - Enable/Disable Standard Ping Response

    fv   save   - Saves current Values to Flash Memory
    fv   show   - Display Current Values
    fv   load   - Load Values from Flash
    fv   default   - Set Values to Default

Adjustment Procedure:

The basic procedure for adjusting (saving) any of the values is as follows:

1. Using a Laptop, open a Hyperterminal Session and adjust the serial port for 19200 Baud, One Stop Bit, 8 Data bits, No parity, and flow control set to none

2. Connect the S2N2E configuration cable to the laptop and the S2N2E.

3. Pressing the enter key should return the "S2N2E> " prompt. If not, then check your serial connections and/or parameters.

4. Once you have established a "S2N2E> " prompt, modify the desired parameter(s) using the "fv" commands: i.e. "fv mpr 2500"

5. Verify that the parameter(s) has been changed. i.e. "fv show"

6. Save the values to Flash memory. i.e. "fv save"

7   Press the Reset Button and/or cycle power to the S2N2E for the values to take effect.

8. You are Done!