1550-N2

Revision 1.7

A-B Drives Protocol
Interface
September 1999

Please Read This Notice   Successful application of the 1550 card requires a reasonable working knowledge of the Allen-Bradley hardware to be interfaced with, and the application in which the combination is to be used. For this reason, it is important that those responsible for implementing the 1550 satisfy themselves that the 1550 and Allen-Bradly hardware combination will meet the needs of the application without exposing personnel or equipment to unsafe or inappropriate working conditions.

This manual is provided to assist the user. Every attempt has been made to assure that the information provided is accurate and a true reflection of the product's installation requirements. In order to assure a complete understanding of the operation of the 1550, the user should read all applicable documentation on the operation of the Allen-Bradley hardware.

Under no conditions will ProSoft Technology, Inc. be responsible or liable for indirect or consequential damages resulting form the use or application of the 1550 product.

Reproduction of the contents of this manual, in whole or in part, without written permission from ProSoft Technology, Inc. is prohibited.

Information in this manual is subject to change without notice and does not represent a commitment on the part of ProSoft Technology, Inc. Improvements and/or changes in this manual or the product may be made at any time. These changes will be made periodically to correct technical inaccuracies or typographical errors.

WARNING

The 1550 card will allow remote access to commands in the Allen-Bradley drives. The User is responsible for assuring that any applicable regulations concerning the remote operation of equipment are adhered to.

Quick Start Guide

In this section we have assembled a simple step-by-step procedure for installing and making the 1550 unit operational. This discussion presumes that the application decisions such as RS-232 versus RS-485, SCANport cable length, etc. have been addressed prior to this point.

Step-by-Step
The following steps will allow the 1550 to be setup in the shortest period of time:

1 Set the dip switches
The 1550 dip switch positions are detailed in Section 3

2 Mount the 1550 on the DIN rail
See Appendix B for mounting instructions.

3 Connect power to the 1550
Please refer to Section 3

4 Setup the Drive hardware
Refer to the appropriate drive manual to connect control and power to the drive. This aspect of the drive installation is out of the scope of this manual.

5 Setup the Drive parameters
See Section 4 of the manual to setup the drive parameters

6 Install the SCANport cable between the drive and the 1550
A cable connection between the 1550 and the drive must be made to connect the SCANports together. See Appendix C for instructions.

7. Connect the serial communication cable between the host system and the 1550.   Section 6 details the cable connection diagrams for RS-232, RS-422 and RS-485 connections to the 1550 unit.

TABLE OF CONTENTS

APPENDIX

1 Product Specifications

The ProSoft Technology, Inc. 1550-N2 cards are hardware products designed to be a communications front end for Allen-Bradley SCANport compatible products (1336 Plus/Force/Vector and 1305 Micro Drives).

The product includes the following functionality:

Metasys N2 Slave Interface
- Binary Input, Binary Output, Analog Input and Analog Output data type commands supported for primary control/monitoring drive parameters
- Supported Command/Subcommands:

0/4	:	Poll Message No Acknowledge
0/5	:	Poll Message with Acknowledge
0/9	:	Status Update
1/1	:	Read Analog Input Attributes
1/2	:	Read Binary Input Attributes
1/3	:	Read Analog Output Attributes
1/4	:	Read Binary Output Attributes
2/1	:	Write Analog Input Attributes
2/2	:	Write Binary Input Attributes
2/3	:	Write Analog Output Attributes
2/4	:	Write Binary Output Attributes
7/2/3	:	Override Analog Output (Set drive frequency)
7/2/4	:	Override Binary Output (Set drive control bits)
F	:	Identify Device Type

  The following commands are recognized, and acknowledged, but do not have impact on the operation of the 1550-N2, and do not return any data:

0/0	:	Time Update
0/8	:	Warm Start

  All other commands return a Bad Command Error Code
- Warning and Alarming functions performed on Analog Input and Binary Input data types
- Change Of State Response buffering

General Specifications
- Configuration via dip switches

Slave Address	:	1 to 63
Baud Rate	:	300 to 19200 baud
Parity	:	None, Odd and Even
Physical Link	:	RS-232, RS-422 or RS-485
Stop Bits	:	1 or 2
SCANport Messaging		
		Type 4 Enable
		Type 5 Enable
		Type 6 Enable
		Type 7 Enable

- Supplied in two forms:
  Open Style   Power supplied by drive, mounted directly to drive
  Enclosed   Power supplied externally (120 VAC)
- Female 9-pin D shell connectors
- Status LED
  SCANport Status (bi-color)
  Serial Port Status (bi-color)
  Tx/Tx Activity Status (amber)
- Current Consumption :   60 ma DC
- Input Voltage
  Open   Supplied by drive
  Enclosed   85 to 264 VAC, 1 Phase
      45 to 63 Hz
- Operating Temp   0 to 50 °C
- Storage Temp   -40 to 85 °C

2   Slave Port Functionality

2.1   N2 Slave Communications

The ProSoft 1550-N2 card supports the Johnson Controls Metasys™ N2 Protocol, as a slave. This capability allows the module to communicate data from an Allen-Bradley SCANport compatible product to a Johnson Controls Metasys Master such as the Johnson Controls Companion™ or Metasys™ software packages.

The following discusses the functional capabilities of the card.

2.1.1   Command/Reply Cycle

Successful communications between a Slave and a Master will always consist of the following two transactions:

Command: Message from master giving instruction to slave.
Reply: Response to command.
A slave station will respond to a master issued command in several ways.

Data Message: If the command was executed by the slave, the response message will include the data requested, or an acknowledgment that the command was executed.

Error Message: If the command could not be executed by the slave, for whatever reason, an error response message is transmitted to the master. The error response message contains an error code indicating the cause of the error.

No Reply: If the master does not detect a reply within its timeout period, the master should re-transmit the command, before a time out error is issued. If the Slave could not decode the message or an error occurred preventing the Slave from recognizing the message, no response will be issued.

2.1.2   N2 System Protocol Commands

The 1550-N2 supports the commands and the data types necessary to enable control of the drive from an N2 master. The data types and the commands, as well as the associated addressable points are overviewed below. A detailed functional discussion on drive control and monitoring is available in Section IV.

Data Types

The N2 System protocol treats data as objects, with each data type having a different structure and purpose. The data types recognized by the 1550-N2 card are as follows:
- Binary Input
- Binary Output
- Analog Input
- Analog Output

Reading Attributes

The contents of these attributes, including object configuration, status, current value, and alarm/warning limits, can be accessed with the following commands:

1/1	Read Analog Input Attributes
1/2	Read Binary Input Attributes
1/3	Read Analog Output Attributes
1/4	Read Binary Output Attributes

Writing Attributes

The data object attributes can be configured by a master using the following commands:

2/1	Write Analog Input Attributes
2/2	Write Binary Input Attributes
2/3	Write Analog Output Attributes
2/4	Write Binary Output Attributes

Controlling the Drive

Access to the drive control function is made available through the Override commands. The following commands and data points allow the drive to be controlled:

7/2/3	Override Analog Output
	- Set drive frequency
7/2/4	Override Binary Output
	- Clear Fault
	- Jog Select
	- Direction Select
	- Stop Select
	- Start Select

Status Update

The host can issue a 'Status Update' command to the 1550-N2. The response will contain device information ("1550-COMM") as well as current status information.

0/9	Status Update

Identify Device

When a master host first powers up, the 'Identify Device' command is issued to all of the slaves. In the case of the 1550-N2 card, the Device Code 10 Hex is returned to the host. When the 1550-N2 first powers up, it will return and error code 0 in response to all commands from the host, indicating to the host that a power up condition has occurred. The host will respond with the "Identify Device' command, telling the 1550-N2 that the host has detected the power condition. The command code is:

F	Identify Device

2.1.3 Command Error Checking

When the Slave cannot execute a command, an error code is generated and returned to the Master. Error codes generated at the Slave will usually be indicative of an illegal function, an illegal address, or bad data.

2.1.4 Data Integrity

As in all good protocols, there must exist a level of data integrity checking to verify, with some degree of assurance, the quality of the transmitted data. The N2 System protocol supports a summation/modulus type of error checking on the address and data content of the communication packet.

2.1.5 N2 Point Layout

A relationship between the N2 Point Address and the Drive Parameters has been set up to ease control of the drive. The relationship, by data object type, is detailed in the Appendix.

3 Hardware Setup

3.1 1550 Card Setup

3.1.1 Connecting Power to the 1550 Card - Enclosed Style

Connecting power to the Enclosed Style Communication Module (1550 model) requires a simple termination of the 120 VAC cable to the front of the module. The connection is shown in the following diagram:

115 VAC Hot ——— L
115 VAC Neutral ——— N
Ground ——— G
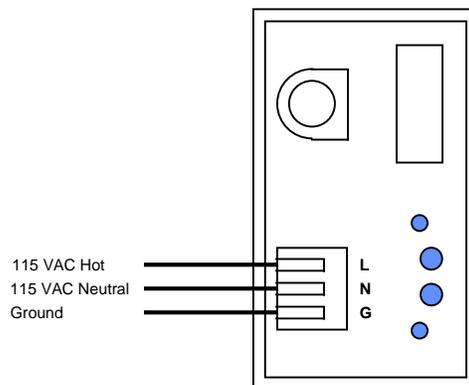
3.1.2 Dip Switch Configuration

Configuration of the 1550 configuration consists of setting up some dip switches. The dip switches are as follows:

> Please note that dip switch configuration is read by the 1550 during the power up process. Power must be cycled if dip switches are changed under power.

Communication Physical Link N2 - RS-485	**SW1** 8 Hardware sel-H 7 | -L	**87** 00 = RS-232 01 = RS-422 10 = RS-485

Slave Address	**SW1**
	 6 MSB dev addr -32
	 5 | -16
	 4 | -8
	 3 | -4
	 2 | -2
	 1 LSB dev addr -1
		Valid Address are between 1 and 63
		 Example:
		     654321
		     001100
		 Reresents address 12

Stop Bits N2 - 1 Stop Bit	**SW2** 8 Stop Bits	0 = 1 Stop Bit 1 = 2 Stop Bits
Parity N2 - None Modbus should select None	**SW2** 7 Parity - H 6 - L	**76** 00 = None 01 = Odd 10 = Even (Odd/Even parity is invalid at this time)
Baud Rate Select N2 - 9600	**SW2** 3 Baud Select 2 1	**321** 000 = 300 001 = 600 010 = 1200 011 = 2400 100 = 4800 101 = 9600 110 = 19200 111 = 19200
SCANport Message	**SW3** 8 Type 7 Enable 7 Type 6 Enable 6 Type 5 Enable 5 Type 4 Enable	Unless specifically instructed otherwise, always enable Type 4 through Type 7 for all applications. Type 2 is enabled by default.
Communication Configuration	**SW3** 3 Comm mode 2 Comm mode 1 Comm mode	**321** 011 = N2 Slave
Not Assigned	SW2 - Bit 4 SW3 - Bit 4	

4 Configuring Drive Parameters

When the drive is first received, several parameters must be setup by the user in order for data transfer and control to be properly implemented.

4.1 Data Transfer

The 1550 units read and write data using the SCANport Type 2, 4, 5, 6, and 7 commands. Using this a total of 10 words of data can be transferred each way. Two of these words

are dedicated to specific functions, leaving eight words for User configuration. In order to accomplish the transfer, the drive's I/O ADAPTOR Data In and Data Out parameters must be configured. A discussion on the SCANport link communications is excerpted from the A-B documentation and included in Appendix C.

4.1.1 Controlling the Drive

The primary configuration which must be performed is associated with enabling Frequency Control from the 1550.

In order to enable Frequency control from the 1550, the drive parameter FREQUENCY SELECT 2 must be configured for the appropriate Adapter ID representing the 1550 module. This will normally be Adaptor #2, unless a SCANport expander is being used (in which case this Adaptor number will be based on the port the 1550 is plugged into.

4.1.2 Setting up the Adaptor I/O - Data Out

Selects the parameter values which will be made available to the 1550 for reading into the register map. The Parameter Table can be found in Appendix A for both the Modbus and Metasys N2 cards which details the placement of the values in the 1550.

Data Out Image	Suggested Parameter	Description
A1	54	Output Current
A2	1	Output Volts
B1	23	Output Power
B2	53	DC Bus Voltage
C1		
C2		
D1	19	Maximum Frequency
D2	4	Last Fault

4.1.3 Setting up the Adaptor I/O - Data In

Selects the parameters which will be made accessible for configuration/writing from the 1550. As with the Data Out parameters, there are eight possible selections.

We do not have any suggestions for parameters to write to. These may be chosen as needed to meet the needs of the application.
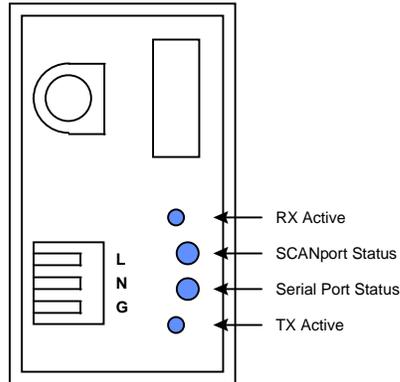
Data In Image	Parameter	Description
A1		
A2		
B1		
B2		
C1		
C2		
D1		
D2		

5 Troubleshooting

Several hardware diagnostics capabilities have been implemented using the LED indicator lights on the front of the 1550 card. The possible conditions as indicated by the lights are:

5.1 LED Locations
The location of the LEDs on the units are shown in the following diagrams:

LED Locations for Enclosed Style unit

5.2 LED Troubleshooting Table
The following table details the meaning of the LEDs in the 1550 unit.

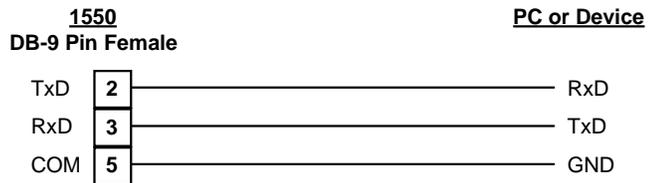| NAME	Color	Status	Indication
Serial Port Status	Green	Blinking	The 1550 has successfully processed a command from the host and has generated a response.
	Red	Steady or Blinking	The 1550 unit has detected a serial communication error condition on the Serial port. This is normally due to a bad communication transmission from a host such as an invalid command or a request for an invalid point
SCANport Status	Green	Steady	SCANport connection if OK
	Green	Blinking	Check cable connections. Indicates that the 1550 unit is not able to link up with the drive's SCANport.
	Red	Steady	The SCANport connection has faulted. Check configuration switch settings, SCANport cable connections, cycle power. Contact ProSoft factory support if problem persits
RX Active	Amber	ON	The 1550 Serial Port (Modbus/N2) has detected some activity on the receive pins.
TX Active	Amber	ON	The 1550 is sending out a response to the host.

6   Cable Diagrams

The communication connections to the 1550 card are made via a DB-9 pin female connection on the front of the card. The physical terminations are shown in the following diagrams.
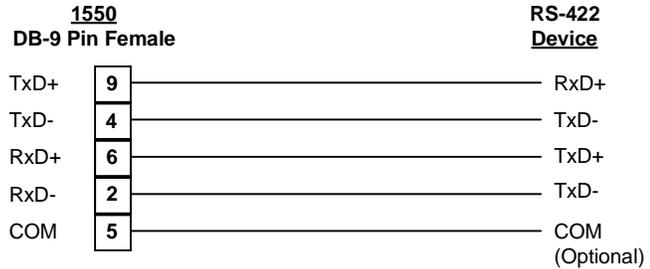
1550 Communication Port
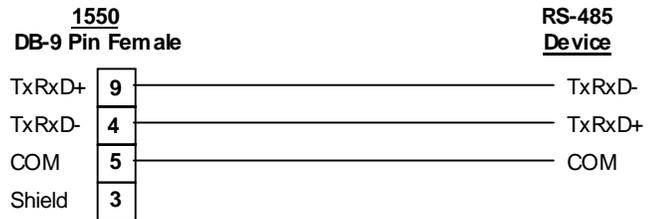
RS-232 w/ No Hardware Handshaking
Port Connection with another communication port

1550					**PC or Device**
DB-9 Pin Female					
TxD	2	————————————	RxD
RxD	3	————————————	TxD
COM	5	————————————	GND

RS-422 4-wire Connection

1550					**RS-422 Device**
DB-9 Pin Female					
TxD+	9	————————————	RxD+
TxD-	4	————————————	TxD-
RxD+	6	————————————	TxD+
RxD-	2	————————————	TxD-
COM	5	————————————	COM (Optional)

RS-485 2-wire Connection

1550					**RS-485 Device**
DB-9 Pin Female					
TxRxD+	9	————————————	TxRxD-
TxRxD-	4	————————————	TxRxD+
COM	5	————————————	COM
Shield	3		

RS-485 and RS-422 Tip

If communication in the RS-422/RS-485 mode does not work at first, despite all attempts, try switching termination polarities. Some manufacturers interpret +/- and A/B polarities differently.

---

7 Support, Service and Warranty

7.1 Technical Support

ProSoft Technology survives on its ability to provide meaningful support to its customers. Should any questions or problems arise, please feel free to contact us at:

ProSoft Technology, Inc.
9801 Camino Media
Suite 105
Bakersfield, CA 93311
(661) 664-7208
(661) 664-7233 Fax
e-mail : prosoft@prosoft-technology.com
http://www.prosoft-technology.com

Before calling for support, please prepare yourself for the call. In order to provide the best and quickest support possible, we will most likely ask for the following information (you may wish to fax it to us prior to calling):

1. Product Serial and Version Number
2. 1550 Configuration Information
   - Dip Switches
   - Communication cabling

7.2 Service and Repair

The 1550 card is an electronic product, designed and manufactured to function under somewhat adverse conditions. As with any product, through age, misapplication, or any one of many possible problems, the card may require repair.

The 1550 product has a one year parts and labor warranty according to the limits specified in the warranty. Replacement and/or returns should be directed to the distributor from whom the product was purchased. If you need to return the card for repair, it is first necessary to obtain an RMA number from ProSoft Technology. Please call the factory for this number and display the number prominently on the outside of the shipping carton used to return the card.

7.3 Warranty

7.3.1 General Warranty Policy

ProSoft Technology, Inc. (Hereinafter referred to as ProSoft) warrants that the Product shall conform to and perform in accordance with published technical specifications and the accompanying written materials, and shall be free of defects in materials and workmanship, for the period of time herein indicated, such warranty period commencing upon receipt of the Product.

This warranty is limited to the repair and/or replacement, at ProSoft's election, of defective or non-conforming Product, and ProSoft shall not be responsible for the failure of the Product to perform specified functions, or any other non-conformance caused by or attributable to: (a) any misapplication of misuse of the Product; (b) failure of Customer to adhere to any of ProSoft's specifications or instructions; (c) neglect of, abuse of, or accident to, the Product; or (d) any associated or complementary equipment or software not furnished by ProSoft.

Limited warranty service may be obtained by delivering the Product to ProSoft and providing proof of purchase or receipt date. Customer agrees to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to ProSoft, and to use the original shipping container or equivalent. Contact ProSoft Customer Service for further information.

7.3.2   Limitation of Liability
EXCEPT AS EXPRESSLY PROVIDED HEREIN, PROSOFT MAKES NO
WARRANT OF ANY KIND, EXPRESSED OR IMPLIED, WITH RESPECT TO
ANY EQUIPMENT, PARTS OR SERVICES PROVIDED PURSUANT TO THIS
AGREEMENT, INCLUDING BUT NOT LIMITED TO THE IMPLIED
WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR A PARTICULAR
PURPOSE. NEITHER PROSOFT OR ITS DEALER SHALL BE LIABLE FOR
ANY OTHER DAMAGES, INCLUDING BUT NOT LIMITED TO DIRECT,
INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES,
WHETHER IN AN ACTION IN CONTRACT OR TORT (INCLUDING
NEGLIGENCE AND STRICT LIABILITY), SUCH AS, BUT NOT LIMITED TO,
LOSS OF ANTICIPATED PROFITS OR BENEFITS RESULTING FROM, OR
ARISING OUT OF, OR IN CONNECTION WITH THE USE OR FURNISHING OF
EQUIPMENT, PARTS OR SERVICES HEREUNDER OR THE PERFORMANCE,
USE OR INABILITY TO USE THE SAME, EVEN IF PROSOFT OR ITS
DEALER'S TOTAL LIABILITY EXCEED THE PRICE PAID FOR THE PRODUCT.

Where directed by State Law, some of the above exclusions or limitations may
not be applicable in some states. This warranty provides specific legal rights;
other rights that vary from state to state may also exist. This warranty shall not
be applicable to the extent that any provisions of this warranty is prohibited by
any Federal, State or Municipal Law that cannot be preempted.

7.3.3   Hardware Product Warranty Details
Warranty Period : ProSoft warranties hardware product for a period of one (1)
year.

Warranty Procedure : Upon return of the hardware Product ProSoft will, at its
option, repair or replace Product at no additional charge, freight prepaid, except
as set forth below. Repair parts and replacement Product will be furnished on
an exchange basis and will be either reconditioned or new. All replaced Product
and parts become the property of ProSoft. If ProSoft determines that the
Product is not under warranty, it will, at the Customer's option, repair the Product
using current ProSoft standard rates for parts and labor, and return the Product
freight collect.

Appendix A
Metasys N2 Point Map

N2 Object	Parameter Description	Values	
BO1	Drive Stop/Start	0 = Stop 1 = Start	
BO2	Drive Jog	0 = No jog 1 = Jog	
BO3	Drive Dir(Fwd/Rev)	0 = fwd 1 = rev	
BO4	Reset Drive Fault	0 = not 1 = reset	
BO5	Speed Ref Select	0 = Freq Select 1, 1 = Freq Select 2	
BO6	Local/Remote	0 = not Local 1 = Local	
BO7	Accel Rate 1	1 = Select Accel Rate 1	Clears Accel Rate 2
BO8	Accel Rate 2	1 = Select Accel Rate 2	Clears Accel Rate 1
BO9	Decel Rate 1	1 = Select Decel Rate 1	Clears Accel Rate 2
BO10	Decel Rate 2	1 = Select Decel Rate 2	Clears Accel Rate 1
BI1	Drive Enabled	0 = Not, 1 = Enabled	
BI2	Drive Running	0 = Not, 1 = Running	
BI3	Command Direction	0 = Rev, 1 = Fwd	
BI4	Rotating Direction	0 = Rev, 1 = Fwd	
BI5	Accelerating Status	0 = Not, 1 = Accel	
BI6	Decelerating Status	0 = Not, 1 = Decel	
BI7	Warning Status	0 = Not, 1 = Warning	
BI8	Fault Status	0 = Not, 1 = Faulted	
BI9	At Reference Status	0 = Not, 1 = At Ref Speed	
AI1	Drive Output Frequency		
AI2	Adaptor Image - Data Out A1	54 - Output Current	
AI3	Adaptor Image - Data Out A2	1 - Output Volts	
AI4	Adaptor Image - Data Out B1	23 - Output Power	
AI5	Adaptor Image - Data Out B2	53 - DC Bus Voltage	
AI6	Adaptor Image - Data Out C1		
AI7	Adaptor Image - Data Out C2		
AI8	Adaptor Image - Data Out D1	19 - Max Frequency	
AI9	Adaptor Image - Data Out D2	4 - Last Fault	
AI10	ScanPort Comm Status		
AO1	Drive Control Frequency		
AO2	Adaptor Image - Data In A1		
AO3	Adaptor Image - Data In A2		
AO4	Adaptor Image - Data In B1		
AO5	Adaptor Image - Data In B2		
AO6	Adaptor Image - Data In C1		
AO7	Adaptor Image - Data In C2		
AO8	Adaptor Image - Data In D1		
AO9	Adaptor Image - Data In D2		

Note : Please make reference to the manual for scaling of AI and AO values, including the number of digits to the right of the decimal point.

AI and AO Object values are presented to Metasys in the Engineering Units of the selected variable. On power up, the 1550-N2 reads the Adapter I/O image and determines parameter scaling from the drive configuration table.

Metasys N2 Point Map